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PLANTS & GARDENS

DWARF CONIFERS

HANDBOOK
N LOW AND
SLOW-
GROWING
VERGREENS

300 Varieties
Described
60 Illustrated

Their Use in
Landscaping

Planting
Maintenance
Propagation

May 1965

NEW SERIES
ol. 21 No. 1

AMONG THE CONTRIBUTORS

Helene M. Bergman (Mrs. Fred W., Jr.), Guest Editor of this Handbook, has been working with dwarf conifers for nearly 20 years. She and Mr. Bergman have used dwarf conifers in ornamental plantings (as well as nursery rows) at their home in Feasterville, Pennsylvania, which they call "Raraflora."

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It is a pleasure to acknowledge also helpful assistance from the Arnold Arboretum, Jamaica Plain, Massachusetts; the Massachusetts Horticultural Society, Boston; Morris Arboretum, Philadelphia, Pennsylvania; National Arboretum, Washington, D. C., The New York Botanical Garden, Bronx, New York; and the Gardens of the Royal Horticultural Society, Wisley, Surrey, England.

FOR FURTHER READING AND REFERENCE ON DWARF CONIFERS

Of the books listed below, only those by Hornibrook and Welsh deal exclusively with low and/or slow-growing conifer varieties. The Hillier book mentioned in the footnote on page 65 is also devoted entirely to dwarfs. The other books named include dwarf varieties among the species treated. Some of the older books are available only in the larger botanic garden and horticultural libraries.

Bailey, L. H. *The Cultivated Conifers.* Macmillan, New York, 1933.

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Gordon, George. *The Pinetum*, 3rd ed. Henry G. Bohn, London, 1880.

Hornibrook, Murray. *Dwarf and Slow-Growing Conifers*, 2nd ed. Country Life, Ltd., London; Charles Scribner's Sons, New York, 1938.

Jenkins, Charles F. *The Hemlock Arboretum Bulletin;* 74 descriptive leaflets, 1939-1951.

Kent, A. H. *Veitch's Manual of the Coniferae.* H. M. Pollett, Ltd., London, 1900.

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Mayr, Heinrich. *Monographie der Abietineen des Japanischen Reiches.* Munich, 1890.

Silva-Tarouca, Ernst Graf. *Unsere Freiland-Nadelhölzer.* Vienna and Leipzig, 1913.

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Welsh, A. J. *Dwarf Conifers* (in preparation). Faber & Faber, London, 1965.

Wilson, E. H. *Conifers and Taxads of Japan.* University Press, Cambridge, Mass., 1916.

AUG 16 1965

THE BROOKLYN INSTITUTE OF ARTS AND SCIENCES
BROOKLYN BOTANIC GARDEN
1000 WASHINGTON AVENUE
BROOKLYN, NEW YORK 11225

Spring 1965
(An issue that has been unavoidably delayed).

What happens in Nature to make a tree no longer a tree? The foliage is essentially the same, but the trunk disappears; it loses the elongate habit of growth, yet retains certain other characteristics. A tree thus "compacted" becomes a shrub and shrub pines, hemlocks, firs, etc. are the subject of this Handbook. They are dwarf trees (see page 9). What a species loses in architectural charm, when it becomes a dwarf, it may gain in other ways. In diminutive form, it has new uses in the man-made landscape of the smaller home properties and gardens of populous towns and cities.

It is a fact of science that a species which is normally large, for example, a pine, may have varieties which are small—or perhaps simply less tall than the parent. They may not always remain small, but their growth rate is slower so that they remain relatively low and/or slow growing.

What uses can be made of dwarf conifers? First and foremost, they excel wherever fine-textured foliage masses are desired in the landscape design. They never bear flamboyant flowers, thus are well suited for the creation of compact low-growing plantings. Their effect can generally be maintained without clipping, shearing, or more than occasional selective pruning.

Second, if one is pursuing a plant hobby, the natural dwarfs make excellent collector's items. Since relatively few nurseries can supply them, locating the desired less-usual varieties can become a fascinating search.

Third, whatever their use, they require much less growing space than full-sized trees. But heed these warnings: 1) Never plant for shade and expect it within your lifetime; 2) even as collector's items, plant them only where they are appropriate, where the setting is right for them.

The discovery of dwarf varieties and their subsequent dissemination have not always been well documented. For an interesting story about weeping hemlocks see page 14.

As to the makeup of this Handbook: It does not pretend to be a botanist's key that will enable the reader to readily name any dwarf conifer variety. Rather, we hope it makes clear the characteristics of the ten most common groups (genera) of conifers (pages 4 and 5), as well as some of the less known kinds (page 6). Once a single genus is understood, it should be fairly easy to recognize the species and varieties under it. After a half-hour with this Handbook, there can be no valid excuse for the botanically or horticulturally untutored person calling every needle-bearing evergreen a "pine."

How to use the Handbook: As an example, note on page 38 that the generic name of the common FIR is *Abies*. A description of the genus follows, then a brief description of the normal species of Silver Fir *(Abies alba)*. There are two dwarf varieties of this (page 39). Next, in alphabetical order, comes the species known as Balsam Fir *(Abies balsamea)* with two low-growing varieties, and so on.

Natural dwarfs in contrast to cultural dwarfs (bonsai): It is only by special techniques of shoot-pruning and root-pruning that the bonsai made famous by the Japanese are kept in a diminutive state. Nearly all of the natural dwarfs ultimately grow to be much larger than bonsai, but need no special attention to control their size. They also differ from bonsai in that with few exceptions they lack artistic form; this trait often can be altered by skillful selective pruning.

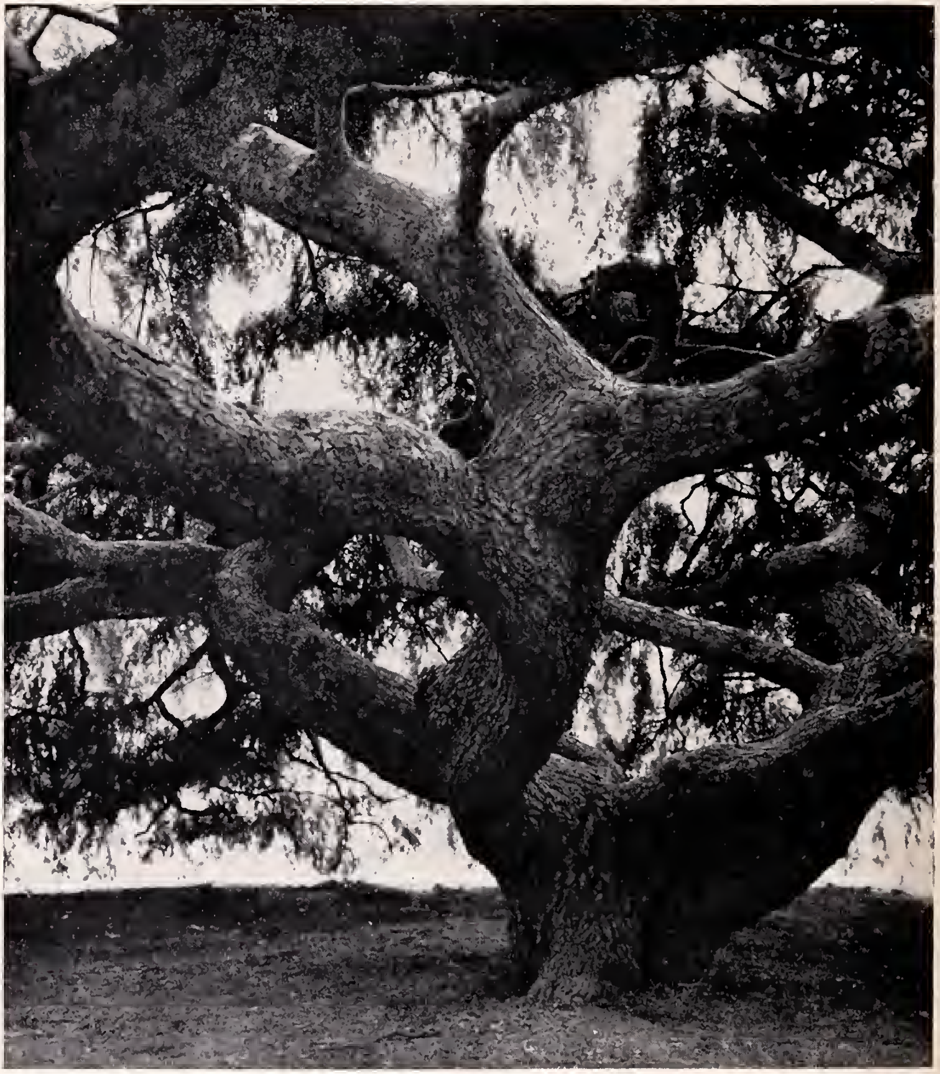
Guest Editor Bergman and Editor Woodward have worked tirelessly to bring this Handbook to completion, and others of the Editorial Committee have been far from idle. Most important, Mrs. Bergman and her husband have either seen or grown all of the 300 varieties included here. They are available in nurseries somewhere—in this country or abroad.

Sincerely yours,

George S. Avery, jr.

Director

⟶ A list of nurseries able to supply dwarf conifers is available for the asking. Enclose a stamped, self-addressed envelope for reply.



Richard Wurts

Branch structure of a 90-year-old Sargent weeping hemlock at Planting Fields Arboretum, Oyster Bay, New York. All branches of this now famous variety are noticeably flattened rather than round.

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DWARF CONIFERS

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90-year-old Dwarf Spruce (*Picea abies* 'Gregoryana') at Cutting Arboretum, Long Island. Trees are now about 5 feet high, 10-foot spread. *Louis Buhle* Cover

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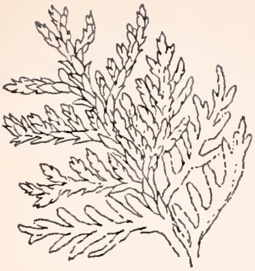
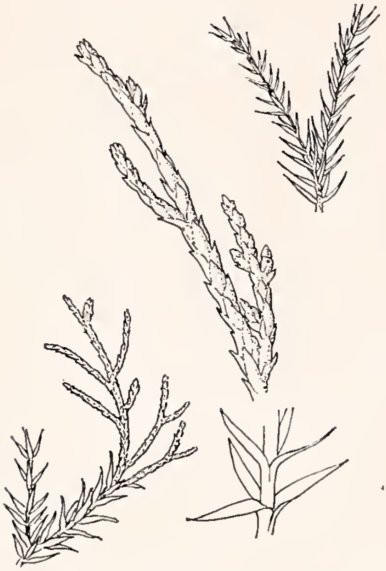
THE TEN MOST COMMON CONIFEROUS EVERGREENS

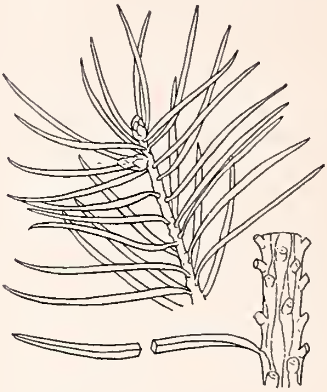
Note:
The numeral after each name indicates the number of low- and/or slow-growing varieties described in this Handbook. These represent about half of all presently recognized varieties.



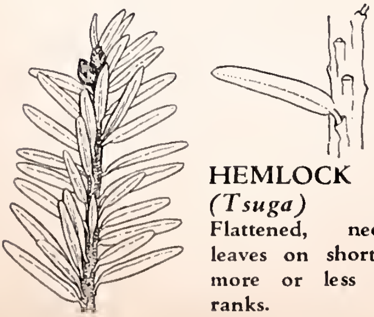
FALSE CYPRESS —74
(Chamaecyparis)
Branchlets mostly in frondlike sprays. Leaves scale-like, in tightly overlapping pairs.



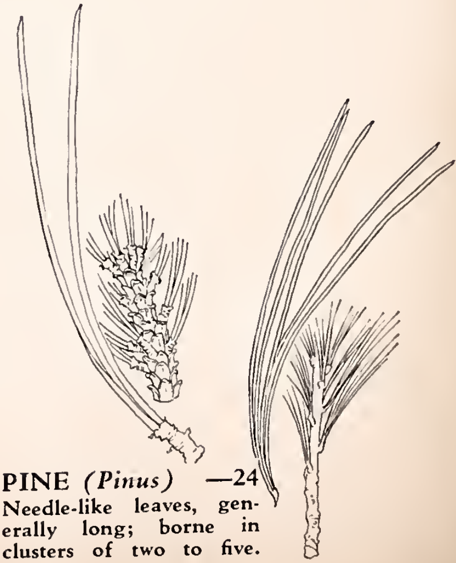
JUNIPER *(Juniperus)* —60
Some leaves scale-like, closely surrounding the twig; others spinelike, pointing outward.



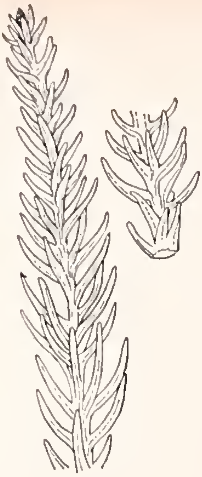
SPRUCE *(Picea)* —47
Short needle-like leaves, usually four-angled, all around the twig.



HEMLOCK —32
(Tsuga)
Flattened, needle-like leaves on short stalks, more or less in two ranks.

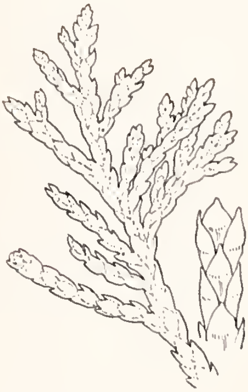


PINE *(Pinus)* —24
Needle-like leaves, generally long; borne in clusters of two to five.

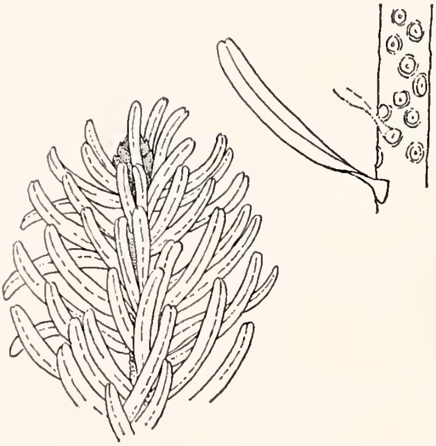


◄

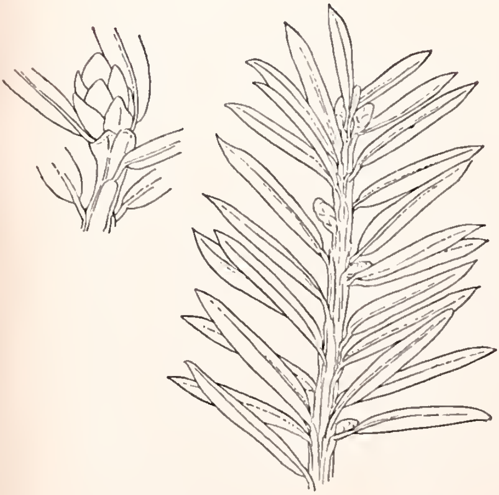
CRYPTOMERIA —15
(Cryptomeria)
Short, somewhat needle-like leaves, four-angled and incurving, spirally arranged around the twig.



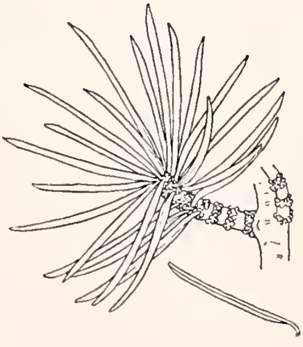
ARBORVITAE —22
(Thuja)
Small scale-like leaves in pairs, tightly overlapping on flattened branchlets.



FIR *(Abies)* **—7**
Branchlets smooth; flattened, needle-like leaves borne spirally around the twig, sometimes appearing two-ranked.



YEW *(Taxus)* **—15**
Flattened linear leaves, mostly green on both surfaces; often in two ranks.

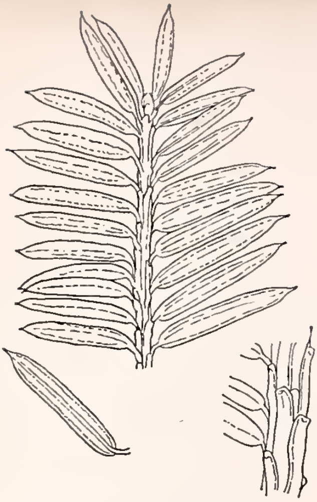


CEDAR *(Cedrus)* **—8**
Short, stiff, needle-like leaves, scattered along the branches and shoots, clustered on the spurs.

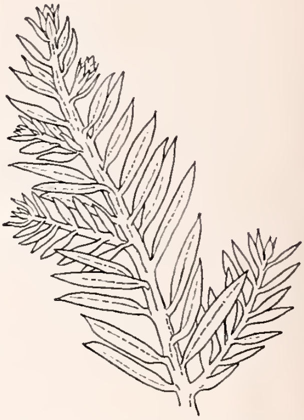
Please turn page for less common kinds.

FIVE CONIFERS LESS WELL KNOWN

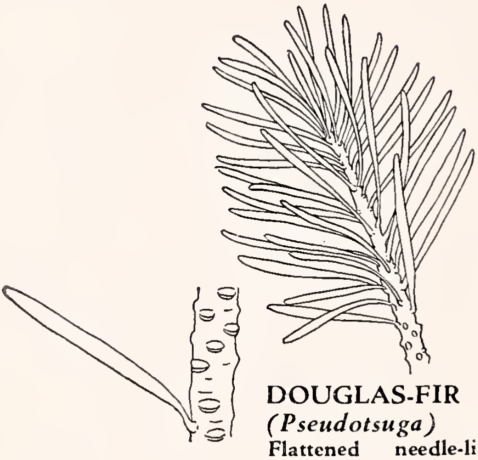
Note: Numeral after name indicates the number of varieties that are described in this Handbook.



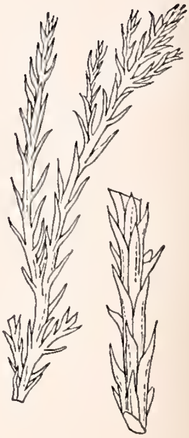
PLUM-YEW —2
(Cephalotaxus)
Like a large-leaved yew, with needles generally in two rows, showing two parallel white lines on lower surface.



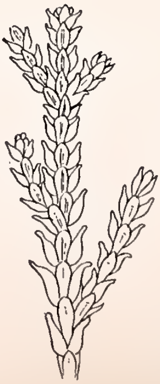
REDWOOD *(Sequoia)* —2
Lateral branchlets with short needle-like leaves of varying sizes in two ranks.



DOUGLAS-FIR —4
(Pseudotsuga)
Flattened needle-like leaves slender and soft, spirally arranged on flexible branchlets.

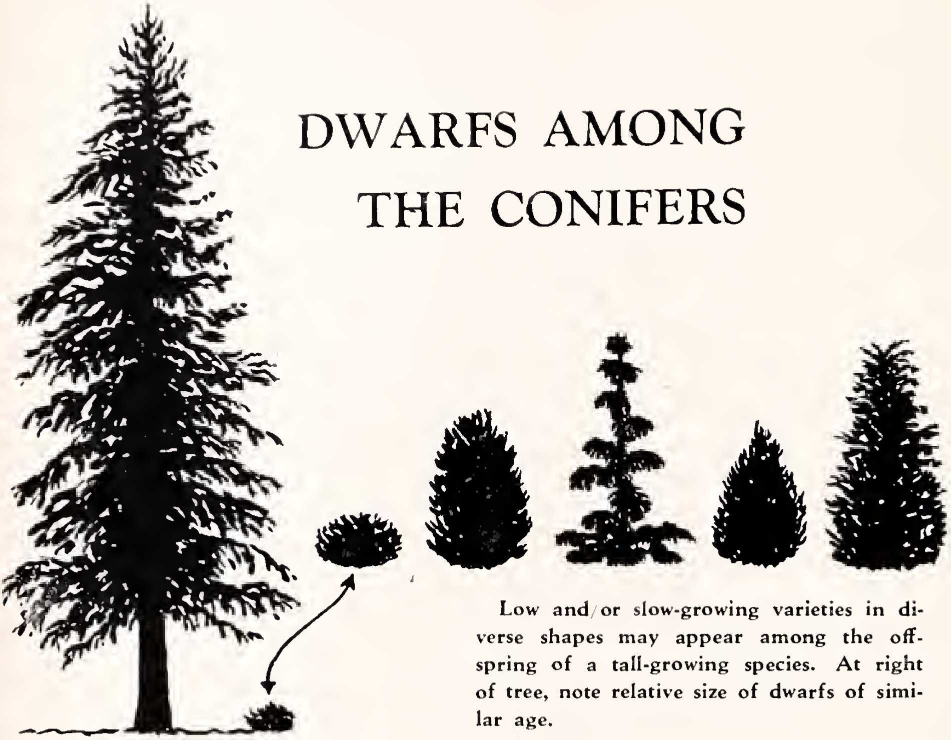


GIANT SEQUOIA —1
(Sequoiadendron)
Leaves small, scale-like, bristly, completely surrounding branchlets.



◄
HIBA ARBORVITAE *(Thujopsis)* —2
Branchlets spreading horizontally as in *Thuja;* leaves also similar but larger.

DWARFS AMONG THE CONIFERS



Low and/or slow-growing varieties in diverse shapes may appear among the offspring of a tall-growing species. At right of tree, note relative size of dwarfs of similar age.

Some background gleanings and a forward look

Helene M. Bergman

CONIFERS play an important part in ornamental horticulture, especially in colder climates where they have always been considered among the choicest of woody plants. Given ample room for growth, conifers are objects of richness and beauty in the cultivated landscape. However, with the trend toward smaller properties and one-story homes, the larger species soon grow out of scale. This has brought the dwarf and low-growing conifers into prominence, "so much so," wrote L. H. Bailey in *The Cultivated Conifers in North America* (1933), "that the desire for them has become a vogue."

Interest in dwarfs has expanded greatly in the last few decades, affected no doubt by our increasing awareness of Japanese concepts of gardening. In order to create representations of natural scenes within the space of their gardens, the Japanese, centuries ago, sought and preserved small and unusual varieties that occasionally appeared among their conifers. It was not known then, nor could it be fully realized until this century, with the advance of modern genetics, that many of these plants were natural dwarfs, not individuals that were stunted by external factors or artifical conditions. Therefore it may have been more than mere coincidence that conifers favored for garden use were species such as Hinoki cypress (*Chamaecyparis ob-*

(*Continued on page 8, second column*)

What is a Conifer?

The evergreen needle-bearing trees that are commonly called pines, hemlocks, firs, and spruces (botanically known as *Pinus, Tsuga, Abies, Picea*) all are conifers. That is, they are cone-bearers; their seeds are developed on the scales that make up the cones.

Other evergreen conifers include the redwood (*Sequoia*) and the giant sequoia (*Sequoiadendron*) of the far western United States; the Douglas-fir (*Pseudotsuga*), also of the West; the true cedar (*Cedrus*) of the Old World, and cryptomeria (*Cryptomeria japonica*) of eastern Asia.

Some Lose Needles

There are also conifers that lose all their needles in winter. They include larch and tamarack (*Larix*) of the Northern Hemisphere, the bald-cypress (*Taxodium*) of the southeastern United States, and the dawn redwood (*Metasequoia*) of eastern China. These also bear their seeds in cones, but since they are deciduous trees they are not included in this Handbook.

Seeds in Cones or "Fruits"

In some conifers the seeds are formed in small, more or less fleshy "fruits" instead of cones, but structurally these correspond to cones. The resemblance is most easily seen in fruits of false cypress (*Chamaecyparis*). In red-cedars and all other junipers (*Juniperus*) the seeds are borne in a small "berry." In the yew (*Taxus*) and the plum-yew (*Cephalotaxus*) fruits are also somewhat berrylike but of softer flesh. The pollen which makes the production of seeds possible is borne in much smaller organs, some of them cone-like bodies that resemble catkins.

(*Continued from page 7*)

tusa), Sawara cypress (*Chamaecyparis pisifera*) and Japanese red pine (*Pinus densiflora*), for these are variable kinds that have produced significant numbers of dwarf, variegated, and other unusual forms.

The existence today of many variegated dwarf conifers is traceable, directly or otherwise, to the Japanese appreciation of colors, even in evergreen plants. Robert Fortune, in an account of his plant-hunting expedition through Japan in 1860, mentions the large number of variegated plants: "For anything I know to the contrary, the Japanese have been cultivating this taste for a thousand years. The result is that they have in cultivation, in a variegated state, almost all the ornamental plants of the country, and many of these are strikingly handsome."

In addition, the early plant explorers found small conifers growing in pots. From records detailing their discoveries, plus subsequent experience in the culture of these plants, a substantial number are now known to be natural dwarfs.

Most people think of a pine tree (*above*) when conifers are mentioned. The dwarf varieties of many other groups are treated in this Handbook.

While the Japanese were probably the first people to appreciate dwarfs and to use them extensively, such plants are not limited to the Orient. In fact, the Norway spruce (*Picea abies*), a fast-growing evergreen that sometimes reaches a height of 150 feet, has probably given rise to more dwarf varieties than any other conifer. (It is somewhat amusing to note that this European tree is better known in the eastern United States than most of the native American spruces. Its widespread distribution was undoubtedly aided by the enterprising nurseryman who sold it as a potted plant during the 1876 Centennial Exposition in Philadelphia.) The dwarf variants of Norway spruce alone could fill a small arboretum. Indeed, spruces are usually the backbone of any collection of dwarf plants.

Another well-known conifer that is genetically variable is the Scots pine (*Pinus sylvestris*). Known in the wild from the British Isles across northern Europe and Asia to eastern Siberia, it is even more widely distributed in cultivation. Among the unusual dwarfs it has produced is one that is bright golden yellow in winter and soft green in summer.

(*Concluded on page* 10)

The dwarf conifer in the foreground, Sargent weeping hemlock, is about 60 years old; the tall hemlock behind it is only half this age.

What is a Dwarf Conifer?

A dwarf conifer is one which for any one of a number of reasons never attains the stature that is usual for the original wild species from which it has been derived.

Dwarf plants are slow growers, but the rate varies from one kind to another. Many, but not all, are of low stature; it is their height relative to that of their parent (the species) that determines whether or not they are to be considered dwarfs. Some are of low stature because of the drooping, twisting or creeping nature of their branches. Others merely grow so compactly, with branches and branchlets occurring at extremely short intervals, that they never reach the size of the species from which they are derived. They are "dwarf" only in comparison with the larger, typical plant. Such low-growing evergreens are likely to appear more densely clothed with needles than conifers of normal size, because the needles of each year's compact growth stand close together on the twigs.

Dwarfs originate either as seedling variations or as bud mutations. In either case, an altered growth rate results in dwarfness.

Dwarf conifers, it will be seen, are therefore not just small young plants, such as are often mistakenly purchased for foundation planting around homes. They are varieties distinct from the normal of the species and as such remain relatively low- and/or slow-growing throughout their lives.

A few of the naturally occurring coniferous species are shrubs, notably in the genera *Juniperus* and *Taxus*. These are to be distinguished from the low- and slow-growing varieties of conifers that are treated here. Except for these, the dwarf and otherwise unusual plants of this Handbook are varieties of species that are normally larger.

(*Continued from page 9*)

North America also has its share of variable conifers, and the eastern, or Canada, hemlock (*Tsuga canadensis*) ranks close to Norway spruce in genetic instability. Dr. John Swartley, who studied the Canada hemlock during the late 1930's and early 1940's, discovered literally hundreds of significant variations. The many fine hemlocks brought into cultivation are in part the result of the Swartley work.

Another familiar native, the eastern white pine (*Pinus strobus*) is also variable. Its dwarfs include contorted, prostrate, variegated, and shrubby plants.

Many unusual forms of the arborvitae of eastern North America (*Thuja occidentalis*) have also been recorded. A few dwarfs of this species retain their so-called juvenile foliage and thus tend to look more like needle-leaved junipers than arborvitaes. The oriental arborvitae (*Thuja orientalis*) also has this trait, as do a few other conifers, notably the Japanese Sawara cypress (*Chamaecyparis pisifera*). In some species, juvenile foliage is retained permanently (these are called "fixed juveniles"); in others, it persists for an indefinite length of time, then changes to the intermediate or adult foliage typical of its kind.

On the Pacific coast, the Lawson cypress (*Chamaecyparis lawsoniana*) is as variable as the Japanese cypresses, and many unusual and dwarf varieties are known. Ironically, most of these dwarf Lawsons did not originate in the United States, but in Great Britain and elsewhere. In fact, the species was discovered in California in 1852 by an explorer for the Scottish Oregon Association. Two years later seeds were sent to the Lawson nursery in Scotland. By 1900 (about twenty years after the founding of the first horticultural society in California) the Lawson cypress was so well established overseas that knowledgeable nurserymen had already selected dozens of unusual forms for the trade. These in turn were brought back to the United States.

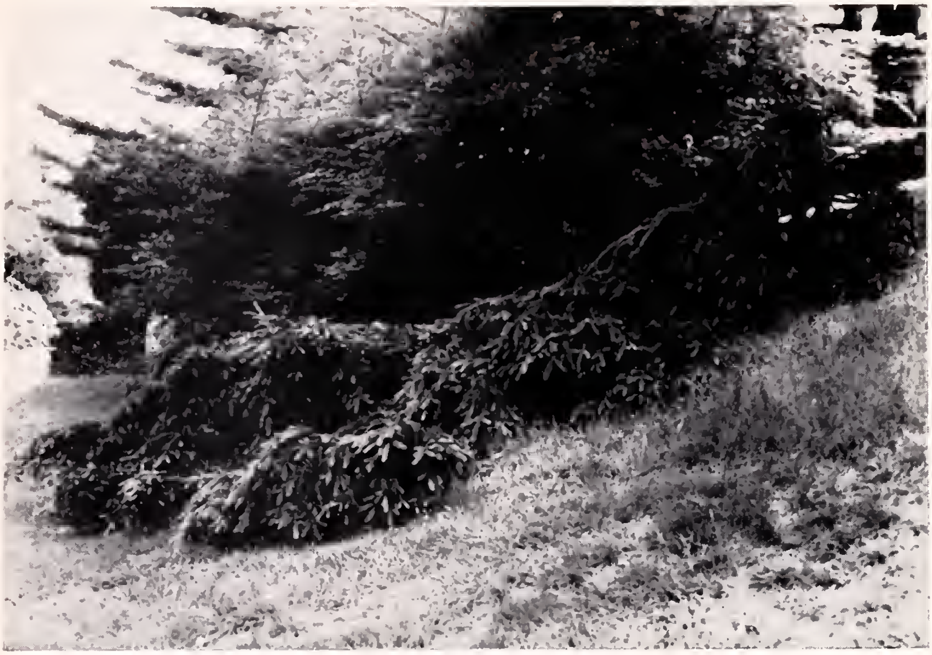
This situation is not too difficult to understand when it is recalled that Ernest Wilson, plant explorer in China and Japan, and Keeper of the Arnold Arboretum, commented in 1928: "Some sixty-five years ago a yew (*Taxus cuspidata*) was brought to this country from Japan, only to be ignored and neglected until comparatively recently." Today this extremely hardy yew is a staple garden item, especially in the North, and its dwarf forms are choice candidates for small gardens and urban sites.

Although the romantic era of botanical exploration is over, many parts of the world are still being combed by amateur as well as professional plant hunters seeking new varieties of horticultural worth. But collecting the plants is only the first step. After testing, evaluation and recommendation—services performed by many arboreta—the final dissemination rests largely in the hands of the commercial grower, for it is the nurseryman who must make this material available to the gardening public. Therefore it is encouraging to note a gradual upgrading in the kinds of woody ornamentals being offered in nursery catalogs throughout the country. Quite conspicuous among them are the dwarf conifers that were scarcely mentioned in catalogs of a few decades ago.

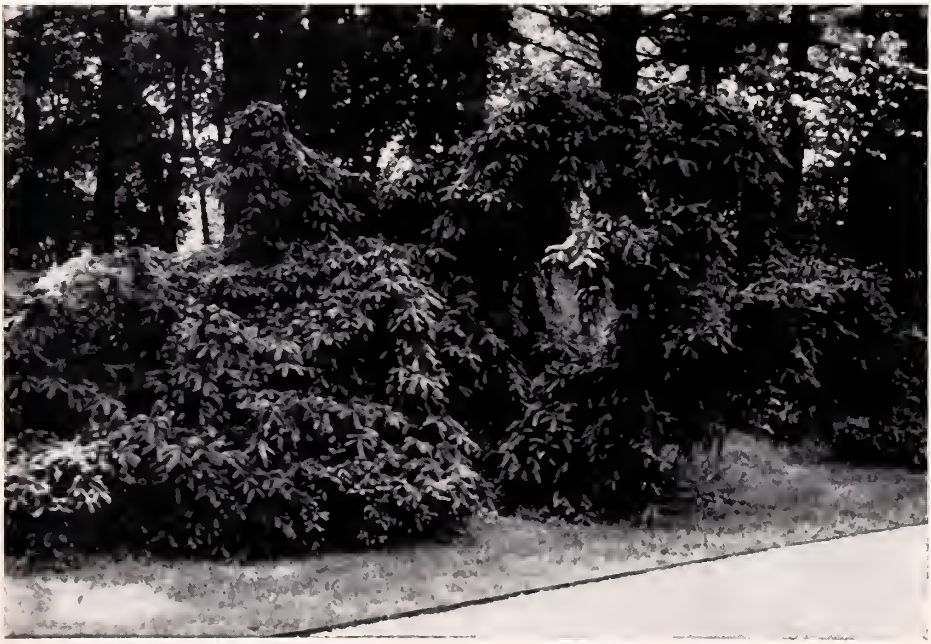
This broadening interest augurs well for the future of ornamental horticulture in general and of dwarf plants in particular, for, as Dr. Frederick Meyer of the National Arboretum has said: "In the United States we are now in the midst of a great renaissance of interest in ornamentals, in fact, the greatest in the history of our country."

When selected with appropriateness to the site, and given suitable care, dwarf conifers are among the most rewarding of evergreens for landscape use.

* * *



A trailing spruce, half a century old, presumably of Japanese origin, on the estate of Mr. and Mrs. Howard Phipps, Long Island, New York. It is about 3 feet high and extends down a slope about 16 feet.



This dwarf Norway spruce is one of several such specimens that border a winding driveway on a Long Island estate. Approximately 50 years old, it is 6½ feet high and about 75 feet in circumference. Its main trunk is about 10 inches in diameter at ground level.

LANDSCAPING WITH DWARF CONIFERS

If varieties are selected with knowledge of their probable future growth, designs like these will remain in scale for many years

Designs by Martin Brooks

◄ In small gardens with crushed stone or gravel surfacing in place of grassy areas, low-growing conifers are appropriate when used with restraint. ▼

◄ A weeping spruce grown alone in a bed covered with crushed stone, a plain wall as the background, can be a dramatic garden feature.

◄
The structural character of stone walls is aesthetically enhanced by plantings of low-growing conifers.

►
Spreading junipers and other dwarfish plants are well suited to the scale of a small pool.

A few tall trees emphasize the small stature of the plants in a collector's garden of dwarf evergreens.
▼

WEEPING HEMLOCKS

John C. Swartley

CANADA hemlock (*Tsuga canadensis*) has spontaneously exhibited extreme variability in leaf and branching characteristics, in shape and in rate of growth. In weeping hemlocks, variation ranges from an extremely low plant known as 'Cole's Prostrate' to upright pendulous forms that grow nearly as rapidly as ordinary hemlock.

The name *Tsuga canadensis pendula* has been almost exclusively associated with the plant called Sargent weeping hemlock, which has been highly prized for many years. But a great many other seedling variations, quite unlike the Sargent weeping hemlock, have been observed in nurseries and in the wild. More than half of these have distinctive characteristics.

According to the records, General Joseph Howland discovered four weeping hemlocks in the Fishkill Mountains in eastern New York State between 1865 and 1870. He transplanted one to his country estate near Beacon, New York. This plant is still alive and is now 15 feet high and 35 feet in greatest spread. The estate is now the site of the Craig House Sanitarium, and those in charge are fully aware of the significance of the old tree. It has excellent care, and bears cones each year. The Fishkill Mountain area, presently known as the Mt. Beacon range, lies just beyond the sanitarium.

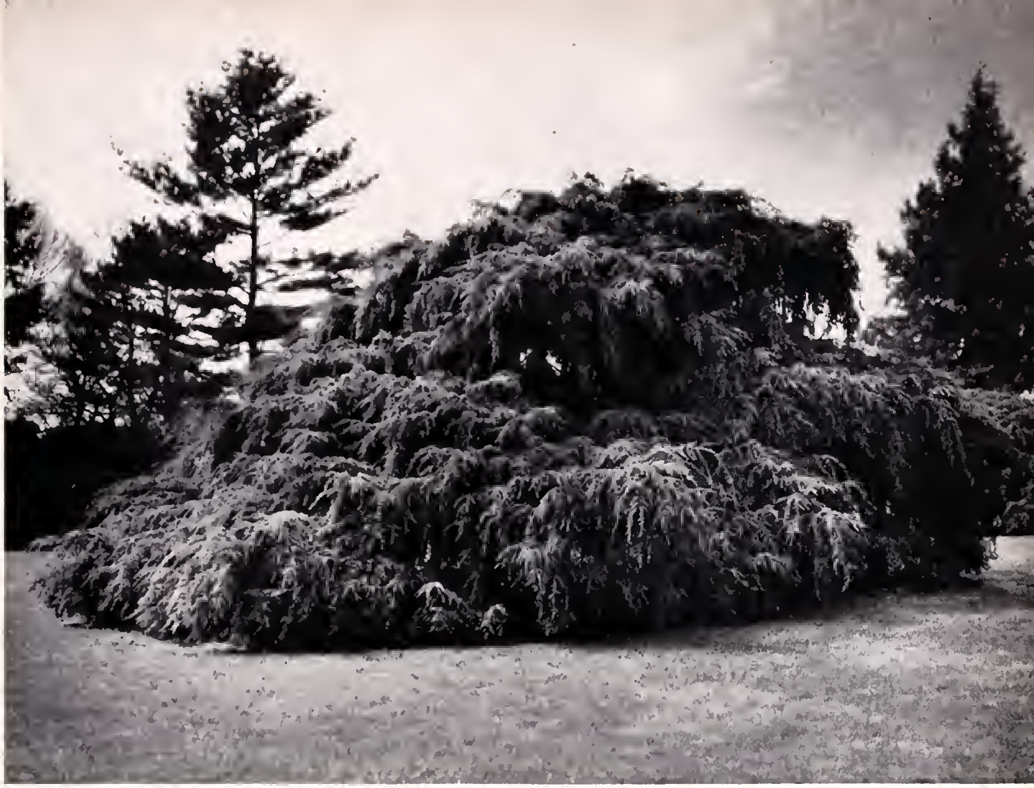
A second was transplanted to Holm Lea, Brookline, Massachusetts, the estate of Charles S. Sargent, longtime Director of the Arnold Arboretum. This plant is now 7 feet high and 30 feet in diameter. The central part of the onetime estate (now divided into many parcels) is on Sargent Drive, and is the property of Mrs. Roger Ernst. The tree is receiving excellent care.

A third was transplanted to the country home of Henry Winthrop Sargent, a friend of General Howland, near Beacon, New York. It was for him that these beautiful weeping plants were named Sargent hemlocks. The fourth plant was taken to the estate of H. H. Hunnewell at Wellesley, Massachusetts. These last two trees died many years ago, but while the Hunnewell one was still alive, a new tree was propagated from it (about 1890). In 1965 this specimen was 12 feet high and 35 feet in diameter. It is a multiple-stemmed specimen, and the largest of its five trunks is 51 inches in circumference.

In 1937, Dr. A. B. Stout of The New York Botanical Garden found another plant of unmistakable Sargent type, along the Eastern State Parkway in New York, beside an old house on property belonging to Joseph Horton. In 1939, the height was over 16 feet and the

American horticulturists have been made aware of the many variations in the Canada hemlock largely through the work of the late Charles F. Jenkins of "Far Country," Germantown, Pennsylvania. From the Hemlock Arboretum he established there, Mr. Jenkins issued 74 descriptive bulletins between 1932 and 1951. These he distributed without charge to interested individuals, institutions and libraries.

Mr. Jenkins began his study of hemlocks as a hobby in 1931, at the age of sixty. Up to this time, most of the hemlock varieties had been selected or at least named by Europeans. By the end of 1937, Mr. Jenkins had collected so many named and unnamed variations that he sought assistance in their classification. The work was undertaken by John C. Swartley, then a graduate student at Cornell. Dr. Swartley's interest in *Tsuga canadensis* has continued.



Richard Wurts

Sargent weeping hemlock at Planting Fields Arboretum, Oyster Bay, Long Island, New York. The tree is estimated (1965) to be about 90 years of age. For the characteristically flattened trunk and limbs of this variety, see the frontispiece.

trunk circumference 4½ feet from the ground was 58 inches. This tree is only about five miles, as the crow flies, from the village of Fishkill. It was regarded by Dr. Stout as the largest living Sargent hemlock. It was independently discovered in 1936 by George L. Ehrle of Clifton, New Jersey, and was observed there later by C. A. Beaujean of Yonkers, New York.

Rather soon after General Howland introduced the Sargent hemlock to cultivation, it was propagated by Parsons & Sons at Flushing, Long Island, New York, and in 1879 it appeared in their catalog. Meanwhile the first printed reference to Sargent hemlock had been made in 1875 in an English journal, *The Garden*. It was first illustrated in *The Garden* in 1887. The first public showing was at the great exhibition in Philadelphia in 1876. Presumably the large specimens in Fairmount Park, Philadelphia, along Belmont Avenue are the 1876 plants. Other large plants can be observed in Pennsylvania at Bryn Mawr College, at the estate of the late Mary K. Gibson in Wynnewood, at the Morris Arboretum in Philadelphia, and at Inver House, an estate in Wayne; in New York State at the Lord estate, Irvington, and at Planting Fields, originally the estate of W. R. Coe near Westbury and Oyster Bay, Long Island.

There are seven large weeping hemlocks at the Bayard Cutting Arboretum, Oakdale, Long Island, probably 10 to 15 years old when planted in 1887. The largest of these, in 1965, was 11 feet high and 125 feet in circumference. Its trunk diameter was 18 inches just above ground level. Several other old specimens of this variety are to be seen in New York City, at the Brooklyn and New York Botanical Gardens.

The examination of these various individual specimens shows differences in comparative height and breadth and in branching habit. Typical Sargent hemlocks are shrublike with no straight trunk, rather with two or more large branches diverging near the ground and developing in a more or less twisting fashion. Others have an upright main trunk of 2 to 8 feet with almost uniform diameter, giving the effect of an umbrella. Nearly all of these have been trained in this manner by staking in the nursery or by grafting high to obtain the same effect. Accompanying the illustration in the 1887 issue of *The Garden,* was a statement credited to Samuel B. Parsons: "It may be readily grafted on high stocks, but it does not thrive as well, the naked stem cracks and suffers, and the massive foliage, like that of most evergreens perched up on the high stems, is too heavy for grace and proportion, and is beaten and tossed by the winds."

There are at least four authentic records of seedling propagation. The first was supplied in a letter from the late Jacob C. Van Heiningen to Dr. Stout and by word of mouth to the writer. In 1906, Mr. Van Heiningen collected seeds from two Sargent hemlocks near the office of Parsons and Sons, Flushing, Long Island. These seeds were sent to his brother in Holland where about two thousand plants were raised, all weeping. In 1918, Mr. Van Heiningen imported 150 of these plants and by 1938 only two were left in his nursery at Wilton, Connecticut. The smaller one is the lowest Sargent hemlock I have ever seen, at that time measuring 2 feet in height and 8 feet in breadth.

The second known example of seedling propagation was by Dr. Stout himself. In 1916 he collected seeds from one of the Sargent hemlocks at The New York Botanical Garden. Of about 25 seedlings, all but one were pendulous and 23 years later the largest weeping plant was 4 feet high and the smallest was 3 feet high.

In 1953, H. Fisher collected seeds from several Sargent hemlocks at the United States Plant Introduction Station, Glenn Dale, Maryland. About 140 plants were grown, all weeping. At the age of ten years, the largest was 40 inches high and 86 inches wide. In contrast, the smallest was 9 inches high and 15 inches wide. In 1962, 14 of these seedlings were planted in front of the Glenn Dale Plant Introduction Station office. Seed was collected from the same original plants in 1960 and distributed to members of the American Horticultural Society. More details may be found in the July 1964 issue of the *American Horticultural Magazine.*

The fourth experience in seedling propagation of Sargent hemlock was reported in a letter received in March, 1965. Alfred J. Fordham, Propagator at The Arnold Arboretum, stated that he is observing 12- to 15-inch seedlings in the Arboretum nursery. All appear to be pendulous. The original Arnold Arbore-

'Cole's Prostrate', smallest of the weeping hemlocks. Plant at left is 3 inches high and 25 inches across. Note bareness of branches at center. Branches of such a specimen may be staked. Plant at right is nearly 14 inches high. Both about 25 years old.

tum plant probably came from the Parsons Nursery. It is now 15 feet high and 25 in diameter.

A weeping variation of much more recent origin was obtained by Fred Bergman of Feasterville, Pennsylvania, from a private garden in Seattle, Washington. A cutting plant was dug and shipped to Mr. Bergman by Carl Starker, a western horticulturist. Its habit is similar to that of the Sargent hemlock but the leaves are somewhat larger and the rate of growth is less than that of Sargent. The original plant at 20 years was 12 inches high and 30 inches in diameter. It is known as *Tsuga canadensis* 'Minuta Pendula'.

Another variation that somewhat resembles Sargent hemlock when small, is the Elm City hemlock that was sent to the Hemlock Arboretum as a small plant about 1931 by the Elm City Nursery Company of New Haven, Connecticut. Compared with Sargent hemlock, it has more undulating branchlets, with most lateral branchlets drooping but a few diverging upward. It is taller for its breadth and has sparser foliage. The original plant has five diverging trunks, not twisted, 5 to 8 inches in diameter and is now 13 feet high and 23 feet in greatest diameter. A cutting-grown plant, rooted in 1946, is growing at Raraflora and is 15 inches high and 48 inches in width. The cones often appear in clusters with as many as a dozen together.

The smallest of the weeping hemlocks is known as 'Cole' or 'Cole's Prostrate'. The original plant was collected by H. R. Cole in 1929 near the bottom of Mt. Madison, Coos County, New Hampshire. It was transplanted to the nursery of Gray and Cole near Haverhill, Massachusetts, where I saw it in 1938. It averaged a bit less than 6 inches in height and 24 inches in breadth. This plant has since died but over a period of years a significant number of cuttings were rooted.

This variation has a most peculiar branching habit. The branches grow outward but soon knuckle over and bend directly downward so almost all the tips are in close contact with the soil. These tips have a tendency to rot. A mulch of pebbles is of some help but the plant grows more rapidly and is perhaps more beautiful if staked to a height of about a foot and then allowed to weep downward like a vernal fountain. In either case, the branches are devoid of foliage in the middle of the top. There are two 25-year-old plants at Raraflora. One, growing without benefit of a stake, is 3 inches high and 25 inches in diameter; the other, which was staked for a time, is 13 inches high and 25 inches in diameter.

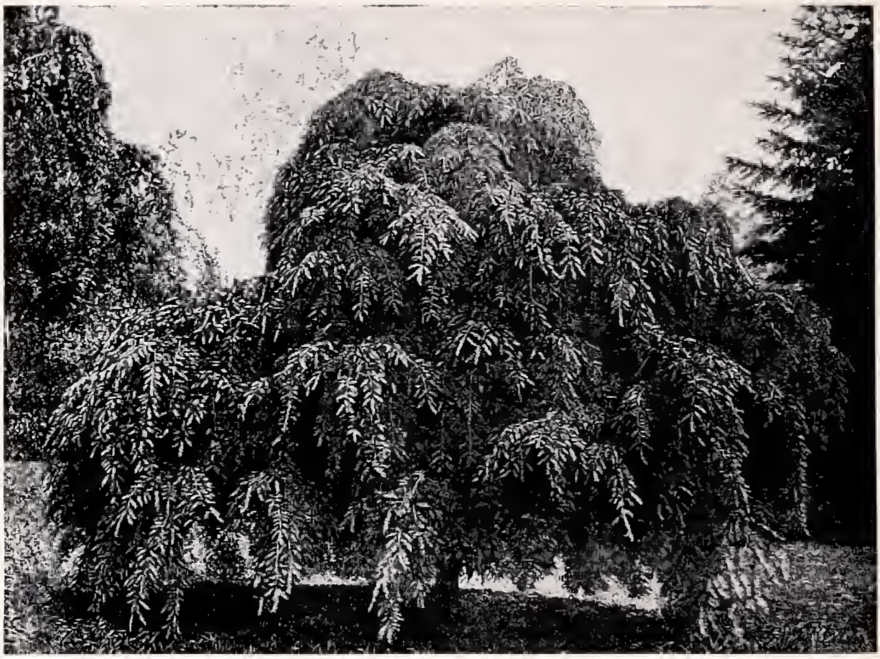
'Gable'. At approximately 30 years of age, the original specimen reached a height of 17 feet, about half the size expected of the normal species. The grafted plant shown here, at 20 years, is only 2½ feet high.

Fourteen years ago, one of these plants produced a mutated branch that Mr. Bergman rooted. This is now a flat-topped, irregularly shaped plant with smaller leaves and stiff habit. It is 3 inches high and 9 inches in greatest breadth.

The history of three other weeping hemlocks of record can be briefly summarized.

'Outpost'—Woodcock Nurseries, Ridgefield, Connecticut. In 1938, 10 feet high. One hundred or more plants started by grafting; none located to date.

'Gable'—Among seedlings acquired from Keene Forestry Association by Joseph Gable, Stewartstown, Pennsylvania, about 1935. Now about 17 feet high. A delicate plant, with branches curving upward then down-



First known illustration of the Sargent weeping hemlock, from an 1887 issue of the English magazine *The Garden* (October 22, page 363). At that time it was called "Weeping Hemlock Spruce." S. B. Parsons, writing to *The Garden*, called this tree the "Queen of Evergreens." "Its sprays," he said, "have a permanent beauty that we see only equalled in a fleeting way by some stray forms of the common Hemlock." At that date, this weeping variety was reported to be a stock plant in most of the best tree nurseries in England.

ward. At Raraflora, a grafted plant, 20 years old, is 30 inches high, 40 inches wide.

'Kelsey'—Found in the wild near East Boxford, Massachusetts, in 1911. Of three similar plants nearby, apparently seedlings, that were dug up by the Kelsey-Highlands Nursery, only one is known today. In 1938 it was 10 feet high. Its main axis grows laterally, almost vinelike.

Why have nurserymen not grown more hemlock variations? One reason is that up until the last decade or so, only the connoisseur was acquainted with them; customer demand is only now beginning to develop. As interest grows, a great many new varieties of dwarf hemlocks will be selected by botanic gardens, discriminating nurserymen and others. Eventually they will be obtainable by all for whom such varieties of the Canada hemlock hold special attraction.

For those seeking further information about the orignal weeping hemlocks, Alfred J. Fordham has written a semi-technical article entitled "Four Fathers of the Sargent Hemlock." It appears on page 9 of the *American Nurseryman* for December 15, 1962.

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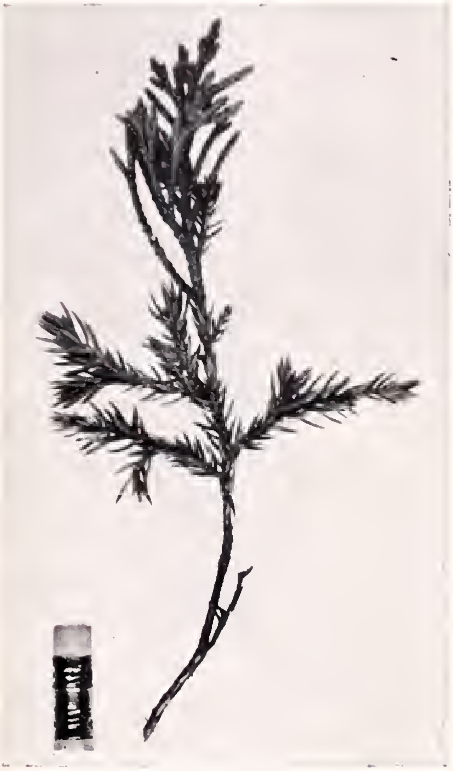
ABOUT "JUVENILE" AND "MATURE" LEAVES

SOME of the everyday words seen in technical books that describe plants have special meanings quite apart from their common use. Other words, of Latin or Greek origin, are seldom seen outside scientific publications.



Branchlets of 'Sargenti', a Chinese juniper variety that, like many other conifers, bears two kinds of leaves simultaneously. At top, the scale-like ("mature") leaves make twigs appear smooth and compact. The lower side branches bear short spinelike ("juvenile") leaves.

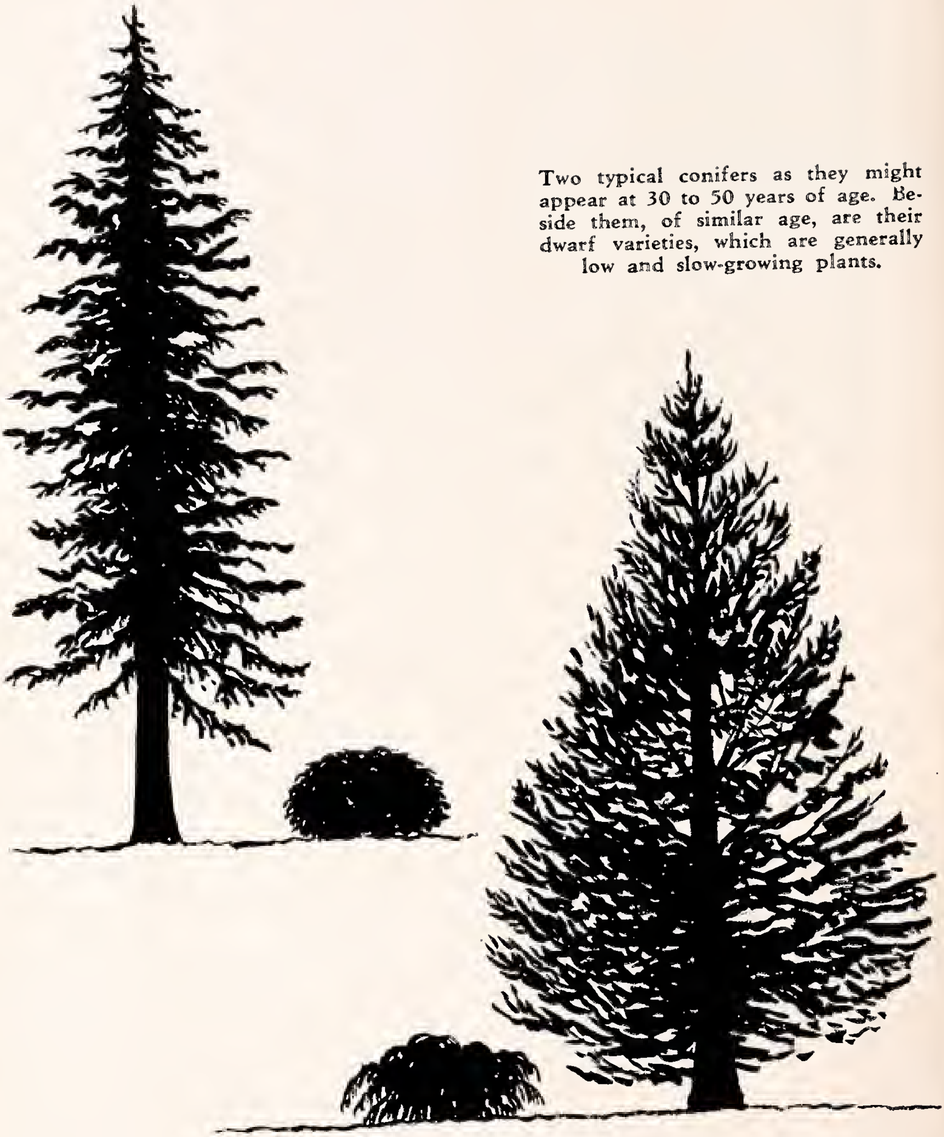
Thus the needles (which are the leaves) of many evergreens are called "awl-shaped." This means only that they taper to a fine point, like a needle; but they are never as long as an ordinary sewing needle. Such leaves are also designated as "acicular," which means sharp-pointed. Most of the leaves so described are like slender delicate spines that point outward from the twigs. In this Handbook they are generally referred to as "spinelike."

These spinelike leaves are the first to develop on certain kinds of conifer seedlings and are therefore commonly called "juvenile" leaves. But they may show up on a plant of any age; indeed, on the same twig with so-called "mature" leaves. Or, they may be the only kind known on the plant throughout its life. This is especially true among the junipers. So, although the term "juvenile" is in common use, it is clearly a misnomer when applied to other than the leaves of a young plant.

The so-called "mature" leaves of conifers such as false cypress and arborvitae are scale-like and cling rather closely to the twig. For the species in which they occur, they are considered the normal foliage. The term "scale-like" is in general use for them, in technical as well as popular accounts of conifers.

Seeds of Sargent Weeping Hemlock

AT the next harvest time, seeds will be collected (upon request) for those who belong to the Botanic Garden's Membership Society. Persons other than Members of the Botanic Garden may request a small packet by sending one dollar, which will be returned if seeds are no longer available. It should be understood that the supply of seeds will be limited, and that probably only a portion of them will produce the weeping variety. All requests for seeds should be accompanied by a stamped, self-addressed envelope.



Two typical conifers as they might appear at 30 to 50 years of age. Beside them, of similar age, are their dwarf varieties, which are generally low and slow-growing plants.

DWARF CONIFERS

Descriptions of 300 kinds, arranged alphabetically by the common name of each genus, or group

ARBORVITAE

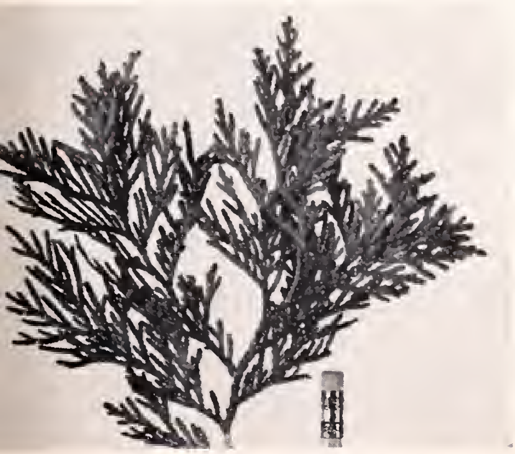
Botanical name of genus: ***Thuja***
Pronunciation: *thoo*-ya

Native arborvitaes can be seen in North America, both west and east, and in eastern Asia. Although in the wild the species are mostly tall trees, in cultivation they are more familiar in smaller sizes.

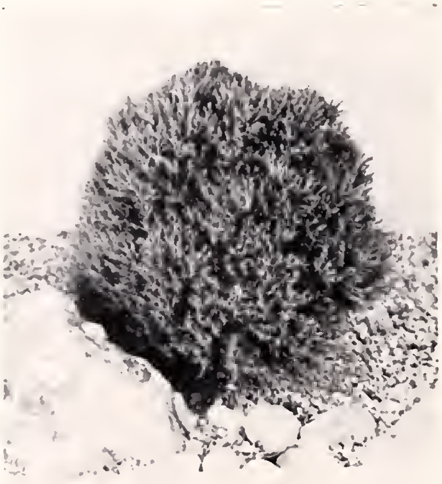
Characteristics of the Genus

Description. Flat, fan-shaped clusters of branchlets completely covered with overlapping pairs of scale-like leaves characterize arborvitae. The cones are small—the largest, in *Thuja orientalis*, barely an inch in length.

This and the American arborvitae (*Thuja occidentalis*) have been prolific in the production of dwarf varieties. Some of these have persistent "juvenile" leaves, which stand out from the branchlets like tiny flat spines or needles. These are the so-called "fixed" juvenile types. Plants that bear scale-like leaves are usually spoken of as "adult" types. Plants whose foliage changes from juvenile to adult are called "transitional." In many of the dwarfs the green of the foliage is little dulled in winter.



Branchlet of arborvitae



American arborvitae 'Ericoides', 20 inches high at 8 years. Note the spinelike foliage.

For the Hiba arborvitae (*Thujopsis*) see page 44.

The Species

***Thuja occidentalis*, American Arborvitae.** Pyramidal tree to 70 feet. Leaves scale-like, bright green, changing to dull brownish-green or brownish-yellow in winter. Some of the dwarf varieties have spinelike leaves exclusively; these are the so-called juvenile types.

Low-Growing Varieties

Spinelike Leaves Only

(*"Fixed Juvenile"*)

'Ericoides'. Conical or pyramidal shrub of soft texture. Branchlets tips slightly pendulous. Leaves glaucous green in summer, turning reddish violet in winter. At 8 years, 20 inches high, 15 inches wide.

Leaves of Two Kinds

(*"Transitional"*)

'Rheingold'. A pyramidal plant that appears in two foliage phases according to the propagating material used. While most of the examples seen in the United States first bear mostly spinelike leaves, those known in England bear mainly "adult" scale-like leaves, described as radiant old gold in winter. Plants with "juvenile" foliage are soft yellow-green in summer, glowing copper in winter when planted in full sun (otherwise a dull brownish-green). On these, when scale-like leaves appear, they turn gold in winter. At 30 years, 6 feet high, 4½ feet wide.

'Ohlendorffii' ('Spaethii'). Upright plant with two kinds of leaves, the "juvenile" ones rigid, about ½ inch long, mostly at right angles to the stem, the "adult" primarily carried in long, erect, whipcord-like strands. Plants resulting from propagation will bear chiefly the type of foliage that is dominant on the propagating material.

Scale-like Leaves

("*Adult*")

Upright Plants

'Batemanii'. Small slender pyramid. Branchlets 4-angled, the scale-like leaves sharply compressed into vertically protruding ridges, givng a somewhat cockscomb-like appearance to the terminal growths. At 33 years, 6½ feet high, 3 feet wide.

'Pendula'. Erect-stemmed plant with pendulous branches. The tips point upward and upright branches that arise from these again bear pendulous growths, the whole making an irregular mass of semi-pendulous branches.

'Wagneriana'. Upright shrub of slender ascending branches forming a broad multi-stemmed pyramid, the branchlets short, dense, and fine. The dark green leaves are glossy. At 30 years, 6 feet high, 5½ feet wide.

Globose Plants
(Branchlets spreading vertically)

'Globosa' ('Tom Thumb'). Very compact with crowded ascending branches. Branchlets in flat vertical sprays, leaves green in summer, tinged slightly on the tips in winter. Slowly reaches 4 feet, or slightly more, in diameter. Common in cultivation.

'Woodwardi'. Low, compact globular plant with erect or ascending and spreading branches. Leaves dark green, slightly discolored at the tips in winter. At about 30 years, 4 feet high, 5 feet wide.

Globose and Spreading Plants
(Branchlets not spreading vertically)

'Froebelii'. Compact, symmetrical globe, with rather dense branchlets arranged in small fanlike sprays that twist in all directions. Tinged purplish-bronze in winter. At 11 years, about 10 inches high, 11 inches wide.

'Globosa Rhindiana'. Globose to somewhat spreading mound, differing from other globose forms in having the branchlets in little rounded tufts or clusters. A 3-foot spread in about 10 years.

'Little Gem'. Dense, regularly globular plant, somewhat spreading, with horizontal and ascending branchlets, finely divided at the ends. Lustrous dark green foliage, slightly bronze in winter. Sometimes confused with 'Pumila'. An old plant, about 25 years, 3 feet high, 3½ feet wide.

'Pumila'. Compact spreading plant somewhat irregular in habit. Branchlets in dense clusters at ends of branches. Dark green leaves in recurving sprays, twisting in all directions, their tips bronze in winter. At 12 years, 11 inches high, 24 inches wide.

'Umbraculifera'. Low, umbrella-like form, with the branches ascending and spreading, tending to turn upward slightly at the tips. Branchlets thin and flat, forming rather open sprays. Slightly discolored at the tips in winter. At 9 years, 14 inches high, 16 inches wide.

The Species

***Thuja orientalis,* Oriental Arborvitae.** Symmetrical, pyramidal tree with ascending branches, to 60 feet. Lacy bright green branchlets in vertical sprays. China and Korea.

Low-Growing Varieties

Spinelike Leaves

("*Fixed Juvenile*")

'Decussata'. A soft bushy shrub, somewhat columnar in shape, with a rounded top. Branches and branchlets erect. The juvenile leaves are glaucous blue in summer, changing to bright plum-purple in winter. At 12 years, 30 inches high, 12 inches wide.

'Rosedalis Compacta'. Ovoid bush of faster growth and finer foliage than 'Decussata'. Three, instead of two, color changes in year. Brilliant gold in spring, glaucous green in summer, and plum-purple in winter. At 15 years, 3 feet high, 2 feet wide.

'Meldensis'. A somewhat more rigid bush with semi-juvenile leaves, light green in summer, coloring lightly to red-violet in winter. At 20 years, about 3 feet high, less than 2 feet wide.

'Minima Glauca'. Small globular to oval bush; foliage in vertical sprays. Glaucous green in summer, warm yellow-brown in winter. At 30 years, 3½ feet high, 2½ feet wide.

Scale-like Leaves

("*Adult*")

'Aurea Nana'. Dense, ovoid little bush with stiff, fan-shaped branchlets. Young growth bright gold in spring, yellow-green in summer, bright bronze-gold in winter.

'Sieboldi'. Compact, round-topped little bush when young, becoming a multi-stemmed, vase-shaped shrub at maturity. Fine, bright-green foliage unchanging in winter. At 32 years, about 7 feet high, 5 feet wide.

The Species

***Thuja plicata*, Giant Arborvitae.** Large tree reaching almost 200 feet. Branches spreading, pendulous at the ends. Branchlets very regular and closely set. Leaves glossy green, scale-like, not discoloring in winter. Alaska to northern California and Montana.

Low-Growing Varieties

'Cuprea'. Dense, very slow-growing pyramidal or conical form. Young growth bright gold changing to creamy-yellow and old gold. Color retained through all seasons, changing to green by the second year. Finely divided branchlet sprays, somewhat recurving. At 25 years, about 18 inches high, 30 inches wide.

'Hillieri'. Upright, irregularly shaped bush. Branchlets thick and stiff, in crowded tufts irregularly placed along the rigid branches. Occasionally long branches protrude. At 15 years, about 4 feet high and wide.

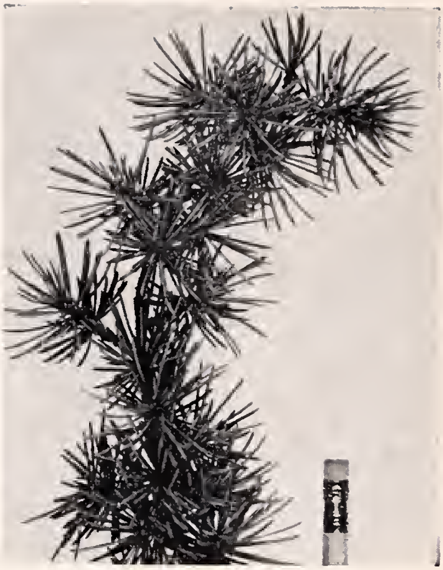
'Rogersi'. Compact small pyramid or cone of ascending branches and branchlets. All exposed foliage is bright gold during the growing season, changing to old gold in winter. At 30 years, 4 feet high, 3 feet wide.

Arborvitae 'Hillieri', 2 feet tall at 8 years

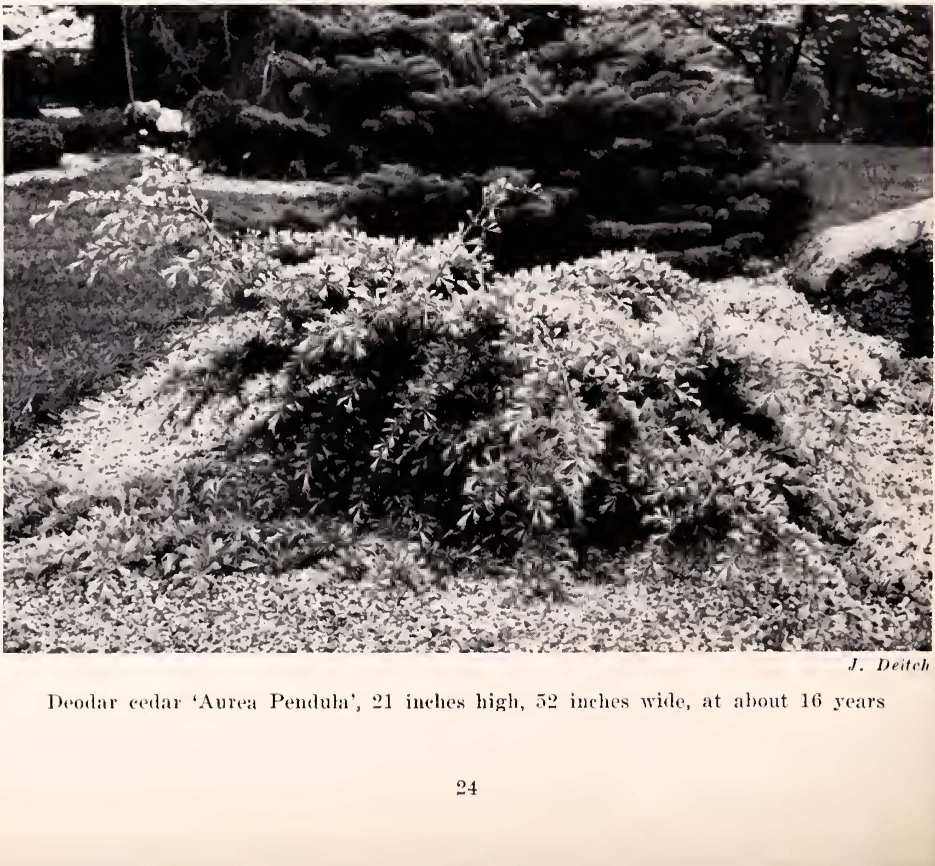
CEDAR

Botanical name of genus: ***Cedrus***
Pronunciation: *sed*-rus

The true cedars grow wild only in the Mediterranean region and the Himalayas. The naturally occurring species are tall, irregularly branched and graceful in appearance.



Small branch of Atlas cedar



J. Deitch

Deodar cedar 'Aurea Pendula', 21 inches high, 52 inches wide, at about 16 years

Characteristics of the Genus

Description. Stiff, angular needles, an inch or so long, are scattered on the long shoots, but clustered on the short spurs which project from the branches. The cones, about 3 inches long, stand upright on the branches.

Fully dwarf varieties, also trailing and weeping types, have arisen through bud mutation or seedling variation. Some have yellow coloring in the needles.

The Species

***Cedrus atlantica,* Atlas Cedar.** Tree to 120 feet or more. Leaves needle-like, less than 1 inch long, bluish-green. Mountains of North Africa.

Low-Growing Varieties

'Aurea'. Many forms have been distributed under this name. One of the most distinctive is a procumbent plant with slightly pendulous branchlets. Young leaves pale glaucous-green, becoming yellow if exposed to sun. Annual growth about 4 inches.

The Species

***Cedrus deodara,* Deodar Cedar.** Tree to 160 feet or more. Leaves needle-like to 2 inches long, bluish-green. Himalayas.

Low-Growing Varieties

'Aurea Pendula'. Semi-prostrate, with wide-spreading branches. Leaves pale yellowish in spring, becoming bright golden-yellow and retaining this color throughout rest of year. Upright shoots occasionally arise; these should be removed.

'Pendula'. Eventually a roundish plant with slender branches spreading across the ground. The stem bends like a knuckle at ground level and produces radially spreading, undulating branches. Habit, growth rate and leaf color are available.

Cedar of Lebanon 'Sargenti', 14 inches high, 52 inches wide, at about 17 years

'Pygmaea'. Dense irregular mound with bluish leaves; plant outstanding in form and color. Annual growth ¼ inch; at 17 years, 12 inches high, 15 inches wide.

The Species

***Cedrus libani,* Cedar of Lebanon.** Tree to 120 feet or more with massive trunk. Leaves to 1¼ inches long, dark or bright green. Asia Minor, Syria.

Low-Growing Varieties

'Comte de Dijon'. Compact, broadly pyramidal shrub. Branches horizontal or slightly ascending, branchlets slender and supple. Leaves fine, to ¾ inch, longer ones occasionally on old branches. Annual growth about 2 inches.

'Nana'. Very similar to 'Comte de Dijon' but looser in habit and with coarser needles, 1 to 2 inches long.

'Sargenti'. Somewhat similar to *C. deodara* 'Pendula', but producing 12- to 14-inch stem before the branches commence to weep; growth more restrained.

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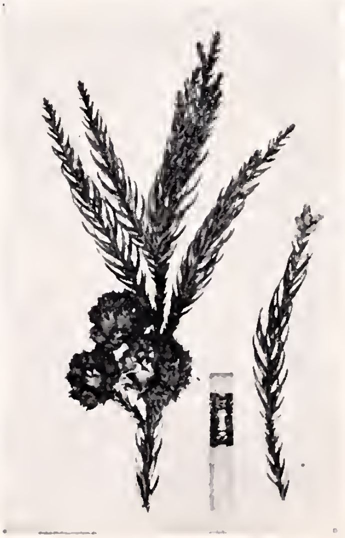
CRYPTOMERIA

Botanical name of genus: ***Cryptomeria***
Pronunciation: crip-to-*meer*-e-a

The single species known as *Cryptomeria japonica* (sometimes called Japanese cedar) is a tall evergreen which has produced a number of fine garden varieties, among them several low-growing dwarf and compact types. Some of these retain their so-called juvenile leaves permanently.

Characteristics of the Genus

Description. The mature leaves are stiff, sharp pointed, four-angled and curved inward. "Juvenile" leaves are sometimes softer; primarily, they are flattened rather than angled or round. Both kinds occur spirally on the branchlets, but appear to grow in regular ranks. Roundish cones, an inch across, remain on the plant long after the seeds have fallen from them.



Branchlets of *Cryptomeria japonica* with seed-bearing and staminate cones

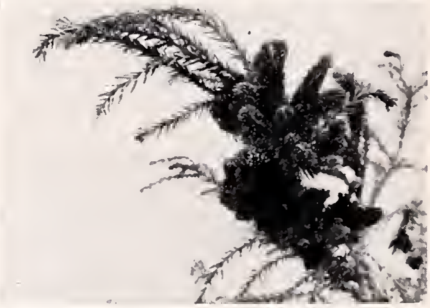
Three of the 15 low- and/or slow-growing varieties described here have "juvenile" foliage.

The Species

***Cryptomeria japonica,* Cryptomeria.** Slender pyramidal tree to 150 feet. Leaves usually of two sizes in five ranks. Japan (var. *sinensis*, southern China). In some varieties contorted branchlets and crowded, abnormal ("monstrous") leaves occur along with the normal growth. Other varieties bear exclusively and permanently "juvenile" and "semi-juvenile" leaves. It is thus apparent that these names do not necessarily have a chronological significance in the life of the plant.

Low-Growing Varieties

Abnormal Leaves, Irregular Plants



Cryptomeria 'Cristata' showing dense growth of needles on abnormal branchlets

'Bandi-Sugi'. Irregular shrub, mostly with normal leaves but with clusters of crowded branchlets which bear short abnormally thickened leaves. Turns only slightly reddish-brown in winter. At 20 years, about 5 feet high and wide.

'Cristata'. Broadly conical, with stiff ascending branches and short crowded branchlets. Cockscomb-like growths form on most of the branchlets.

'Monstrosa Nana'. Slow-growing shrub with very stiff irregular branches and branchlets, tips with crowded clusters of "monstrous" twigs and leaves. Turns bronzy-red in winter. At 45 years, about 5 feet high and wide.

'Pygmaea'. Irregular spreading shrub, wider than high. Branches and branchlets sometimes fasciated. Contorted, cockscomb-like growth also occurs. Leaves blue-green, thin and rigid. At 25 years, 3 feet high, 4 feet wide.

'Spiralis Elongata'. Irregular columnar plant with thin, pendulous, thread-like branchlets. The fine leaves are held closely around the branchlets, often twisting around them. Annual growth, 2 to 3 inches.

'Viminalis'. Loose, somewhat open shrub, with elongated, snake-like branches which usually have no branchlets. Where branchlets occur, they vary in length and arrangement. At 40 years, about 15 feet high and wide.

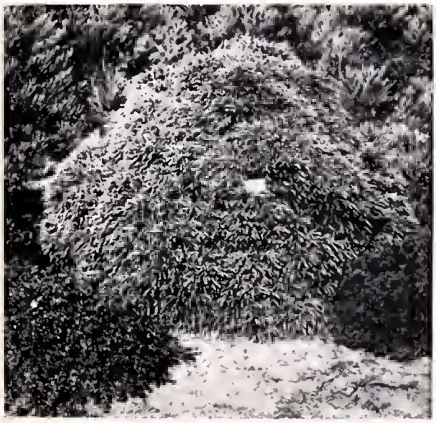
Symmetrical Plants

("Juvenile" and "Adult" leaves)

'Compressa'. Dense, rigid little mound with ascending branches and branchlets. Leaves of two types: either fine and small (juvenile to semi-adult) or long, flat, lance-shaped and recurved, both kinds regularly spaced. At 30 years, 21 inches high, 30 inches wide.

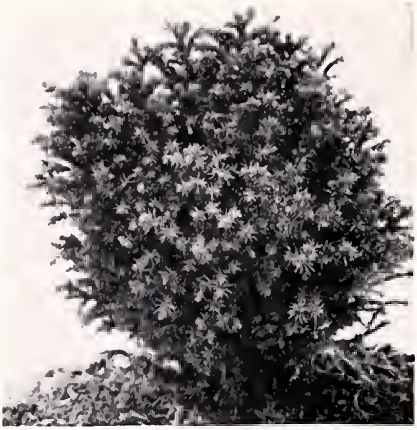
'Elegans'. Dense large-growing shrub with crowded branchlets. Leaves all juvenile, flat and narrow, to 1 inch long. Turns bronze-red in winter.

'Elegans Nana'. Similar to 'Elegans' but more compact, with more symmetrical branching and with pendulous tips.



F. G. Meyer

Cryptomeria 'Globosa Nana' in the Hesse Nursery, Weener/Ems, Germany; 3 feet tall, 40 years old



Cryptomeria 'Vilmoriniana', 1 foot high at 15 years

'Globosa'. Compact plant with arching branches and branchlets, globe-shaped when young. Leaves bright green, as in the species. At 15 years, about 2 feet high, 2½ feet wide.

'Globosa Nana'. Broadly cone-shaped when young, becoming globose only with age. Leaves light green, mostly fine and rather small. At 80 years, 8 feet high and wide.

'Jindai-Sugi'. Compact, rather regular pyramid. Branches ascending and spreading. Branchlets short and crowded. Leaves fine, short, and closely set, bright green. Slightly bronzy in winter. At 20 years, about 3½ feet high, 2½ feet wide.

'Knaptonensis.' Conical, or in some plants a spreading mound. Leaves pale green, very fine. Young growth white, turning green the second year. The young leaves sometimes twist around the branchlets but straighten with age. Annual growth about 1 inch.

'Selaginoides'. Pyramidal or rounded shrub with long branches bearing at their tips regularly spaced whorls of longish branchlets, all of even length. Leaves spinelike, rather appressed to branchlets.

'Vilmoriniana'. Low mound. Leaves small and fine, of two sizes but appearing uniform because of density of growth. Becomes deep reddish-bronze in winter. At 40 years, about 2½ feet high.

DOUGLAS-FIR

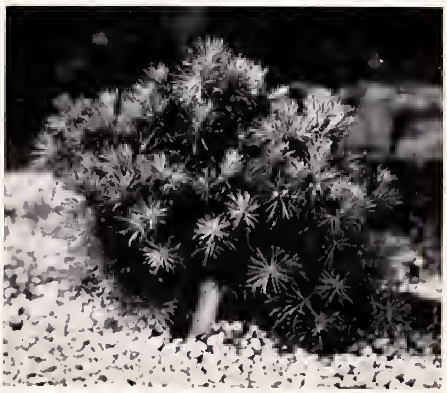
Botanical name of genus: ***Pseudotsuga***
Pronunciation: soo-do-*tsoo*-ga

So many variations have appeared in the tall western evergreen known as Douglas-fir that it has at times been divided into ten different species. Most botanists, however, settle for one species with numerous varieties. While long referred to as *Pseudotsuga taxifolia,* this North American species today is generally called *P. menziesi.* Other species grow in Asia.

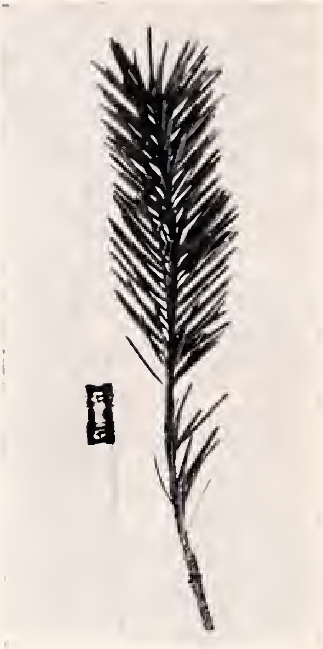
Characteristics of the Genus

Description. Irregular branching gives grace in spite of the great size of older trees. The slender flattish needles, about an inch long, occur spirally on the twigs. The winter buds are reddish-brown, slender and pointed. The pendent cones, to 4 inches long, are easily recognized by the large, three-pointed bract that protrudes from underneath each scale.

Although the naturally occurring Douglas-fir is one of the country's tallest trees, miniature varieties exist among its offspring.



Douglas-fir 'Nana'. About 8 inches high at 12 years



Twig of Douglas-fir

The Species

***Pseudotsuga menziesi,* Douglas-fir.** Pyramidal tree, 250 to 300 feet. Branchlets pubescent. Leaves bluish-green, ¾ to 1¼ inches long, soft. British Columbia to California, Montana, Colorado and New Mexico.

Low-Growing Varieties

'Densa'. Flat-topped shrub with horizontal to slightly ascending branches. Branchlets not pendulous. Leaves ¾ inch long, dark green, radially arranged around the branchlets.

'Nana'. Rounded, mop-headed little bush with irregularly spreading branches. Leaves bluish-green, ¾ inch long, and pointed. At 12 years, 8½ inches high, 9 inches wide.

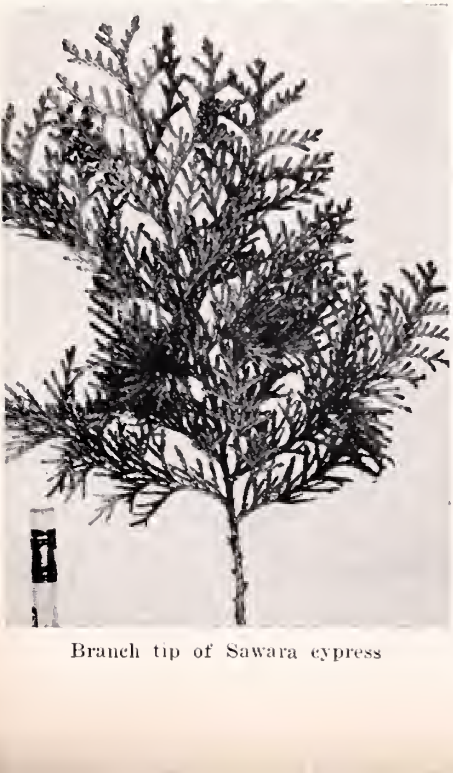
'Prostrata'. Creeping plant with branches fanning out from a bent-knuckle stem. Leaves about 1 inch long, radially arranged, bluish-green. Annual growth about 2 inches.

'Pygmaea'. Irregular small mound with short crowded branches and branchlets. Leaves light yellow-green and short. At 11 years, 9 inches high, 8 inches wide.

FALSE CYPRESS

Botanical name of genus:
Chamaecyparis
Pronunciation: kam-e-*sip*-ar-iss

Most species of *Chamaecyparis* are ultimately tall trees, but in cultivation there are many dwarf varieties that are desirable for home landscaping. Two naturally occurring species are found in western North America; one is common in the eastern states; the others are native to Japan and Taiwan. During the last century certain juvenile and transitional forms of false cypress (and also of arborvitae) were listed under the now obsolete name "Retinospora." A few nurseries still persist with this classification, the shrubs so distributed being, for the most part, varieties of *Chamaecyparis pisifera.* These are often used in foundation plantings and shrub groupings. Unfortunately not all are dwarfs as people expect them to be, and some of them eventually become trees.



Branch tip of Sawara cypress

Characteristics of the Genus

Description. The leaves are scale-like and are borne in closely overlapping pairs on flaring sprays of branchlets. The "juvenile" leaves that appear in some varieties are spinelike. Chiefly because of similarities in their juvenile leaves, these false cypresses are frequently confused with some of the junipers.

The low-growing, compact, fastigiate, pendulous, and other growth patterns that make a variety differ from the natural species, may arise from bud mutations ("sports") or through seeds. The fact that certain plants are prone to variation from seed provides an important source of dwarfs and other horticultural varieties.

The Species

***Chamaecyparis lawsoniana,* Lawson Cypress.** Columnar to pyramidal tree, 150 to 200 feet. Branchlets flattened and frond-like in horizontal planes. Leaves scale-like, appressed, green or glaucous. Oregon to northern California.

Low-Growing Varieties

Juvenile leaves somewhat spinelike; semi-juvenile leaves more rounded (not flat) and slightly convex; variable.

'Ellwoodi'. Slender, spire-like shrub, with more or less fastigiate branches. Branchlets with slightly twisted tips. Leaves semi-juvenile, very blue. At 11 years, 34 inches high, 9 inches wide.

'Ellwoodi Variegata'. Similar to "Ellwoodi' but the blue leaves are marked with creamy-yellowish variegations.

'Ericoides'. Rounded shrub, sometimes broadly conical. The spinelike leaves are glaucous. Semi-juvenile leaves are sometimes present also. Annual growth about 1 inch.

'Fletcheri'. Conical form, somewhat similar to 'Ellwoodi', but higher and broader and tips of branchlets not twisted. Exposed leaves bluish-green, inner leaves dark green.

In the four following groups of varieties, plants bear scale-like ("adult") leaves.

Globose to Broadly Conical Plants

'Globosa'. Broadly globose shrub with ascending branches and rather thick, short branchlets, the tips of which recurve slightly. Leaves bright green. At 8 years, 6 inches high and 10 inches wide.

'Krameri'. A dense globe with ascending, spreading branches, some of which become contorted with age. Branchlets short and thick. Leaves dark green. Annual growth 1½ inches.

'Minima'. Conical shrub, globose when young. Its branches are inclined to twist vertically. Leaves green to yellowish green. Annual growth about 1¼ inches.

'Minima Aurea'. Identical with 'Minima', but young growth tipped with bright gold, turning green the second year. At 30 years, 3½ feet high, 2½ feet wide.

'Minima Glauca'. More globular than the two preceding forms but with branchlets twisting similarly. Leaves bluish to gray-green. At 25 years, 3 feet high, 4 feet wide.

'Nana'. Broadly conical shrub, globose when young, with ascending branches. Similar to 'Minima' but branchlets more horipontal. Leaves yellow-green. At 35 years, 6½ feet high, 5 wide.

'Nidifera', a Lawson-Nootka cypress hybrid, nearly 2 feet high at 11 years.

F. G. Meyer

Lawson cypress 'Forsteckensis' at the Hesse Nursery, Weener/Ems, Germany; 4 feet tall at 40 years

'Pygmaea Argentea'. A rounded mound of ascending, spreading branches, the sprays of branchlets twisting more or less horizontally. Young leaves silvery-white, turning bluish-green the second year. At 20 years, 2 feet high and 3 feet wide.

Spreading Plants

'Knowefieldensis'. Low, spreading, flat-topped shrub with arching branches and widespread, fan-shaped, somewhat pendulous branchlets. Leaves bluish-green. At 6 years, 1 foot high, 2 feet wide.

'Nidifera' (suspected of being a hybrid: *C. lawsoniana* x *C. nootkatensis*). Low, spreading shrub with the branches radiating from the center. Branchlets arching, with pendulous tips. Leaves bluish-green. At 25 years, 2 feet, 9 inches high, 9 feet wide.

'Tamariscifolia'. Low, spreading, umbrella-shaped shrub with ascending branches. Branchlets irregular, pointing in all directions, their sideshoots often twisting and overlapping. Leaves flat and thin, green. Annual growth about 3 inches.

Upright Pyramids and Cones

'Aurea Densa'. Blunt-topped, conical or almost pyramidal shrub, somewhat similar to 'Minima' but of looser growth. Branchlets more or less vertical. Leaves bright golden-yellow. At 30 years, 4 feet high, 3 feet wide.

'Gimborni'. An ovoid shape like a fat candle flame. Branchlets rather thick, slightly twisted sideways. Leaves bluish-green, young growth purplish-blue. At 18 years, 2 feet high, 15 inches wide.

'Juniperina'. A spreading shrub, sometimes a low pyramid. The scale-like leaves are somewhat diamond-shaped, resembling those of *Juniperus sabina*. The leaves at the base of the branchlets turn yellowish in winter. At 8 years, 7 inches high, 10 inches wide.

'Lutea Nana'. Columnar shrub with more or less horizontal branches like those of 'Nana'. Young leaves with creamy-yellow tips, turning green the second year. At 30 years, almost 5 feet high and 2½ feet wide.

Abnormally Branched Plants

'Caudata'. Rounded plant with ascending and then spreading branches. Terminal branchlets crowded into tufts, resembling witch's-brooms. By about 10 years of age, some of the terminal tufts develop pendulous tails, 4 to 8 inches long. At 8 years, 16 inches high, 20 inches wide.

'Filiformis Compacta'. Densely globular bush, with drooping thread-like branchlets, resembling a wet mop. Leaves small, bluish-green, with conspicuous white markings. At 15 years, 1½ feet high, 2½ feet wide.

'Forsteckensis'. Evenly globular when young, gradually developing crowded tufts of branchlets like small witch's-brooms. At 30 to 50 years, about 2 feet high and slightly wider. Looser, larger-growing forms are also distributed under this name.

'Lycopodioides'. Irregular, broadly conical shrub with twisted, cord-like branchlets tangled and curled in all directions. Needles glaucous blue. At 30 years 5 feet high, 7 feet wide.

'Thrandtensis Caesia'. Spreading, broadly conical shrub which, like 'Forsteckensis', produces terminal tufts of branchlets. Leaves dark grayish-blue. At 12 years, 18 inches high, 30 inches wide.

The Species

***Chamaecyparis nootkatensis,* Nootka Cypress.** Pyramidal tree to 120 feet or more. Branchlets nearly quadrangular, leaves dark green. Alaska to Oregon.

Low-Growing Varieties

'Glauca Compacta'. A very compact oval bush when young, tending to become globular with age. Sprays of foliage inclined to twist sideways; needles very glaucous. Semi-juvenile foliage is usually present on the inner growths. At 22 years, 4½ feet high, 4 feet wide.

Nootka cypress 'Glauca Compacta', 4½ feet high in 22 years (in the right background a dwarf Alberta spruce)

The Species

***Chamaecyparis obtusa,* Hinoki Cypress.** Broadly pyramidal tree, 75 to 120 feet. Leaves scale-like, with rounded tips, closely appressed, lustrous dark green. Branchlets in a horizontal plane, the tips slightly drooping. Japan.

Low-Growing Varieties

One variety bearing only spinelike leaves (a "fixed juvenile").

'Ericoides'. Rounded cone with stout branches and thick, rigid, linear, grayish-blue leaves which turn plum-purple in wniter; the only "fixed juvenile" form of this species. Annual growth about 1 inch.

In the three following groups of varieties, plants bear scale-like ("adult") leaves.

Small Compact Plants

'Mariesi'. Broadly conical but irregular shrub. Young shoots variegated white, becoming yellowish in winter and turning dark green the second year. At 25 years, 2 feet high and 2½ feet wide.

'Nana'. Low, flat-topped shrub with horizontal branches. Branchlets cup-shaped in tiered layers. Leaves very dark dull green. At 30 years, about 6 inches high, 8 inches wide.

'Nana Aurea'. Blunt-topped little pyramid with a stout stem and horizontal branches. Leaves gold and cream, with cream areas changing to bronze during cold winters. At 16 years, 21 inches high, 20 inches wide.

'Nana Contorta'. Small conical shrub; when young much like 'Nana'. Branches somewhat twisted. Leaves dull dark green. At 30 years, less than 3 feet high and 15 inches wide.

'Nana Kosteri'. Compact, spreading, flat-topped shrub with cupped, slightly ascending branchlets. Leaves slightly bronzy-green, more bronze in winter. At 7 years, 8 inches high, 10 inches wide.

'Nana Tonia'. Small mound or cone with cupped, twisted branchlets. Terminal shoots sparsely flecked with white their first year. At 8 years, 12 inches high, 11 inches wide.

Large Upright Plants

'Crippsi'. Narrowly pyramidal or conical shrub. Branchlets in dense, flat sprays. Leaves golden yellow, turning green the second year. At 40 years, 15 feet high (Rochester, New York).

'Lutea Nova'. Somewhat open pyramid with ascending branches and finely divided branchlets. Variegation pattern similar to 'Nana Aurea' but paler and with more conspicuous white areas. Annual growth about 4 inches.

'Nana Gracilis'. Compact pyramidal shrub, probably the best known dwarf variety of *C. obtusa.* Branches ascending, branchlets crowded in cup-shaped sprays. Leaves lustrous dark green. At 30 years, 4 to 5 feet high.

Miniature seedlings of 'Nana Gracilis'. These arose from a planting of fertile seeds set by *C. obtusa* 'Nana Gracilis' in an English nursery.

'Minima', with mossy small branchlets, is the smallest of this group. At 25 years, 5½ inches high, 9 inches wide.

Hinoki cypress dwarfs, both 17 years old. *Left:* 'Juniperoides Compacta', 9 inches high; *right:* 'Minima', two-thirds as tall

Hinoki cypress 'Pygmaea', which has grown to less than a foot in height in 15 years

'Juniperoides Compacta' is the largest. At 25 years, 9 inches high, 12 inches wide.

'Bassett', 'Caespitosa', 'Intermedia', 'Juniperoides' and **'Stoneham'** are more or less intermediate between the other two.

Spreading and Prostrate Plants

'Nana Repens'. Roundish, flat-topped plant when young, but spreading later. Branchlets crowded, cup-shaped. Leaves green. At 7 years, 8 inches high, 24 inches wide.

'Pygmaea'. Spreading, flat-topped shrub with tiered, horizontal branches and flat, fan-shaped branchlets. Leaves green, tinged bronze in summer, becoming almost russet in winter. At 30 years, 2 feet high, 3½ feet wide.

'Pygmaea Aurescens'. Very similar to 'Pygmaea' but inner leaves slightly golden-bronze in summer, entire shrub turning more or less golden-bronze in winter.

The following plants are unusual in that the branches and sometimes the leaves are abnormally shaped.

'Coralliformis'. An irregular but compact, blunt-topped pyramid, with cordlike branches and semi-pendulous branchlets. Terminal shoots protruding, twisted, thickened and usually pendulous. At 25 years, 5 feet high as well as wide.

'Coralliformis Nana'. More stunted, but otherwise identical with 'Coralliformis'.

'Filicoides'. Spreading shrub, with long, narrow, flat branches and short, compound branchlets of even size. Leaves thick, glossy deep green, turning purplish-bronze in winter. At 25 years, 8 feet high as well as wide.

'Filicoides Compacta'. Nearly identical, but much slower growing.

'Lycopodioides'. Irregularly spreading shrub, forming flattened cockscomb-like heads on its leading shoots. Leaves variable, mostly spirally aranged, bluish-green. At 30 years, 6 feet high, 8 feet wide.

'Lycopodioides Aurea'. Identical, but leading shoots tipped yellow.

'Tetragona Aurea'. Conical shrub, with ascending branches and short, crowded branchlets of two types: thickened and flat at the tip, mossy along the sides. Terminal growth orange-gold throughout the year, older growth creamy yellow, eventually green; shaded areas green. At 30 years, 10 feet high, 5½ feet wide.

'Torulosa'. Broadly columnar, round-topped shrub, with erect leading shoots. Branches contorted and twisted with small flattened cockscomb-like tips. Foliage resembles in part that of 'Coralliformis'. At 25 years, 8 feet high, 5 feet wide.

'Tsatsumi'. A spreading mound of stout, threadlike branches and arching, pendulous branchlets. Long, pendulous terminal shoots protrude from the bush and tend to divide at the tip into even clusters of very short twigs. More open and lax than 'Coralliformis'. At 50 years, about 12 feet high.

Roche

Hinoki cypress 'Nana Gracilis'

Sawara cypress 'Gold Dust'. At 9 years, 2½ feet in height and breadth.

The Species

***Chamaecyparis pisifera*, Sawara Cypress.** Fast-growing, slender tree to 150 feet with horizontal branches, the branchlets flattened in horizontal planes. Scale-like leaves held close with only their tips spreading slightly outward. Japan.

From the standpoint of foliage characteristics, this species ranks as the most variable and bewildering of all the conifers. Its dwarf varieties have many different kinds of "juvenile," "intermediate" and "adult" foliage. In addition, some are transitional, that is, they commence life with one kind of foliage and then, at some indefinite age and apparently as part of their normal life cycle, they change foliage characteristics. Obviously, this peculiarity has caused tremendous confusion in their identification, especially since their names, having been applied at one or another stage of their development, are not always accurately descriptive of their foliage when a clone is under observation at a different period.

Low-Growing Varieties

In the so-called "fixed juveniles" the leaves are spinelike instead of scale-like as in the naturally occurring species. With the following three plants this so-called juvenile stage is permanent, or "fixed," although occasional branches may develop some other kind of foliage.

'Boulevard' ('Cyano-viridis'). Free-growing conical form of intense blue-gray. Leaves are longer than in 'Squarrosa', and slightly twisted.

'Squarrosa'. The original juvenile-leaved plant brought from Japan in 1843. Although much smaller than the species, it becomes a large pyramid of feathery, glaucous-blue foliage.

'Squarrosa Dumosa'. Somewhat variable in outline, but usually globular or flat topped. Much more compact than 'Squarrosa', with short crowded branches, semierect branchlets and glaucous-green foliage. Annual growth about 2 inches.

In the "fixed intermediate" varieties below, the leaves are more or less between spinelike "juvenile" leaves and the normal scale-like leaves of the species. Plants in this group have foliage that does not change character with age. *Chamaecyparis pisifera* 'Plumosa', the first plant recorded with foliage of this sort, had branchlets in soft plumelike sprays, hence the name. Widely grown in Japan, it was originally thought to be a distinct species, but was later found to be merely an unusual variety of *C. pisifera*. Although the name 'Plumosa' refers essentially to the branchlet structure, it has since been applied to *C. pisifera* varieties that bear similar types of leaves, whether or not the plumelike sprays are present.

'Gold Dust'. Conical or broadly pyramidal with rather open branching, the branchlets in narrow plumelike sprays. Leaves mostly 'Plumosa' type, but some "juvenile" ones usually persisting at the base of the plant. Excellent gold variegation retained throughout the year on the terminal growths, the leaves green the second year. Annual growth about 4 inches.

'Plumosa Rogersi'. Conical shrub with ascending branches and somewhat spreading branchlets irregularly arranged. Foliage a mixture of juvenile and 'Plumosa' type needles, the latter finer and more spreading than normal 'Plumosa'. Current year's growth yellow, becoming bronze-gold in winter. Annual growth about 3 inches.

There are a number of other 'Plumosa' forms, mostly larger growing and requiring shearing for tidy compactness.

In contrast to the plants with permanent "intermediate" foliage, varieties described below and on the next page first display one type of leaf, then another. Thas is, plants are marked by the continuance, for an indefinite period of time, of juvenile and/or intermediate (that is, semi-juvenile) kinds of foliage. Cause, continuance and termination of the various foliage cycles are not fully understood. In all transitional forms, the development of various types of foliage is not the precise, orderly process that it appears to be in print. Such plants frequently alternate their foliage types while passing through their individual growth cycles. The transitional forms can easily be separated into two distinct groups, primarily on the basis of their intermediate foliage alone, although there are other distinctive differences as well.

Group One—Keeled intermediate foliage—the leaves with dorsal ridges

'Plumosa Aurea Compacta' ('Juniperoides'). Much the same as 'Plumosa Nana Aurea', but stronger growing and with coarser foliage, the variegation more pronounced. Usually less juvenile foliage present, and confined mostly to the base, but this is variable.

'Plumosa Nana Aurea'. For many years a low, extremely slow-growing, cushion-shaped plant. Initially with juvenile foliage only, which is primarily recurved, regularly arranged, and glaucous blue-green. This is followed later by green keeled intermediate foliage. Still later a semi-adult foliage develops on the leading shoots. Approaching maturity, the foliage becomes more adult in appearance and the plant assumes a more upright habit. Branchlets normally yellow tipped from spring to late winter. At 22 years, about 2 feet high.

'Squarrosa Minima'. Globular when young, eventually a spreading, rather flat-topped mound, tinged lightly with yellow in spring. Glaucous-green juvenile leaves sometimes retained exclusively for many years (16 in one known case). The keeled intermediate foliage that develops next is variable in arrangement, being both distantly placed and strongly appressed. The semi-adult foliage follows in rather close order. At 18 years, 20 inches high, 29 inches wide.

Group Two—'Compressa' type intermediate foliage

Juvenile foliage variable, sometimes as in Group One, but also having juvenile needles that are larger and distantly placed, similar to those in variety 'Squarrosa'. Intermediate foliage is quite similar within this group, and for convenience is being designated here as 'Compressa', since the first plant accurately described as having this type of foliage was called 'Plumosa Compressa'. This was a mutant that had occurred as a sport on a tree of *C. pisifera* 'Squarrosa' in Holland. It was exhibited in London in 1925. It had two kinds of foliage, juvenile and an intermediate type, very glaucous, that was midway between the needles of 'Squarrosa' and 'Plumosa'. Since then other forms have occurred with this 'Compressa' type foliage, varying slightly in size, habit, etc. Unfortunately, young propagations are difficult to separate if the parent plant is unknown. 'Plumosa Compressa', as it matures, develops into an irregular, spreading little mound of glaucous blue foliage that has a peculiarly "crisped" appearance.

'Argentea Pygmaea'. Somewhat similar to 'Squarrosa Pygmaea', but looser in growth and inclined to pass relatively soon into adult foliage.

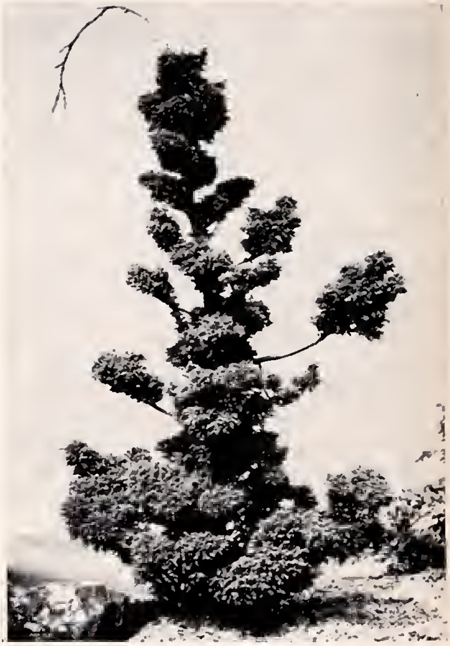
'Plumosa Cristata'. Initially a dense, spreading, irregular little mound of mixed juvenile and 'Compressa' foliage. Main branches gradually ascending with the old foliage dropping cleanly from the base of the branches. Newer foliage is borne in dense, cockscomb-like heads at tips of branches. A plant 3 feet high and 29 inches wide is 15 years old and commencing to develop its first adult scale-like needles. Where the intermediate stage is especially desirable, as in this plant, it can be maintained by cutting out the adult growth. The plant will then continue to produce intermediate foliage for an indefinite time.

'Squarrosa Intermedia'. At first a rather loose glaucous-blue ball of juvenile and 'Compressa' foliage. According to the manner of propagation, this phase may last an indefinite time (20 years in one instance); then long arching strands of semi-adult foliage emerge. Later the plant becomes an irregular pyramid carrying a fairly equal mixture of 'Compressa' and adult foliage. Propagations of this may remain globular at the bottom with a few tall spire-like shoots on top, having a cupola shape for a period of time; but this phase is not permanent.

'Squarrosa Pygmaea'. A very symmetrical little globe of mixed juvenile and 'Compressa' foliage. Apparently an unusually stable form of very slow growth, with foliage more dense than similar cultivars. At 14 years, 11 inches high.

Roche

Sawara cypress 'Squarrosa Pygmaea'



Sawara cypress 'Plumosa Cristata', showing the cockscomb-like branch tips that develop with age. 3 feet tall at 15 years

In the two following groups of varieties, the plants bear scale-like ("adult") leaves. Although there are a number of dwarf pisiferas having "normal" scale-like leaves, none of them duplicate exactly the adult foliage of their species.

Globular Plants

'Compacta Variegata'. A somewhat misleading name since this form, which is somewhat similar to 'Nana Aureo-variegata', is actually looser and stronger growing. Eventually grows into a rather loose pyramid. At 30 years, 6 feet high.

'Nana'. Somewhat flattened globe when young, then gradually spreading at the base with the center rising into a rounded peak or dome. Also sometimes compactly conical. Needles somewhat convex, in fan-shaped little sprays, very glaucous on the underside. At 30 to 40 years, to 5 feet wide, 2 to 4 feet high.

'Nana Aureo-variegata'. Similar to 'Nana' but splashed with yellow variegation. The green portions become a rather golden bronze-green in winter.

Threadlike Branches and Branchlets

Branches spreading, the branchlets long and thread-like, very distantly divided. The typical adult branching structure is absent.

'Filifera Aurea'. Broadly conical shrub, becoming more blunt-topped with age. Horizontally spreading branches with pendulous branchlets. Bright yellow foliage except where shaded. At 30 years, 8 feet high, 15 feet wide.

'Filifera Flava'. Smaller than 'Filifera Aurea' with more pendulous compressed branching, and sulfur yellow in color.

'Filifera Nana'. Rounded, somewhat flat-topped mound with arching, pendulous branches and branchlets like green string. At 25 years, 2½ feet high, 3½ feet wide.

The Species

***Chamaecyparis thyoides*, White-cedar.** Tree to 80 feet, spirelike at the tip, the branches horizontal or spreading slightly upward, the branchlets slender and irregularly arranged. Grows in cold swamps throughout the eastern United States.

Low-Growing Varieties

'Andelyensis'. Slender, erect, conical shrub, usually with both spinelike and scale-like leaves, the spinelike ones mostly disappearing with age. Conspicuous white markings on scale-like leaves, which are bluish green in summer, dark reddish violet in winter.

'Andelyensis Nana'. Cushion-shaped, with spinelike leaves predominating.

'Ericoides'. Small blunt-topped cone or spreading mound of spinelike leaves exclusively. Deep reddish violet in winter. Annual growth about 1 inch.

White-cedar 'Andelyensis', bearing two types of leaves simultaneously; in 8 years, 2½ feet tall

REVERSION

WHILE most dwarf varieties are constant in character, the possibility of reversion exists, especially among plants that have originated from bud sports (rather than seedlings). In such cases usually only one or a few branches will revert to the parental type of plant. If allowed to grow for one or a few seasons, it becomes apparent that such branches are different from the dwarf type. Unless cut out, such growth usually destroys the character of the dwarf.

Another type of "reversion" concerns certain pendulous varieties which occasionally give rise to upright "leader" branches. These in time may grow strongly and become arborescent. They should be cut out as soon as discovered.

Reversions of this type result from sectoral chimeras, which are isolated "islets" of tissue that are genetically different from most of the plant. When such a bit of tissue occurs at the growing tip of a stem, any new branch that develops from its further growth is likely to differ from other parts of the plant.

FIR

Botanical name of genus: ***Abies***
Pronunciation: *ay*-be-eez

About 40 different kinds of fir grow naturally in the temperate regions of the Northern Hemisphere, both in North America and the Old World. Their stateliness gives a distinctive character to the mountain slopes where many of them are found.

Characteristics of the Genus

Description. Horizontal branches encircle the trunk at intervals, giving fir trees a pyramidal silhouette. Needles of most species are about an inch long. The cones stand erect. When ripe they fall apart, leaving only the central axis pointing upward. The winter buds are usually coated with resin.

In contrast to the naturally occurring species, some small-growing varieties have been found. These are of diverse habit — some shrubby, others with branches clinging to the ground.

Branchlets of fir

The Species

***Abies alba,* Silver Fir.** Tree to 150 feet. Winter buds not resinous. Leaves about 1 inch long, pointing upward and outward, lustrous dark green with white bands beneath. Mountains of central and southern Europe.

'Compacta', a dwarf selection from the tall-growing species *Abies amabilis;* 2½ feet in 30 years is the growth record at the Pinetum Blijdenstein, Hilversum, The Netherlands

F. G. Meyer

J. Deitch

'Nana', a dwarf balsam fir, 15 inches high and less than 2 feet in breadth at the age of 20 years

'Compacta'. Slow-growing, compact, rounded shrub with crowded, upright branches and numerous short branchlets. Leaves short, lustrous green. At 30 years, about 40 inches high and wide.

'Pendula'. Weeping or prostrate shrub with branches that sometimes hug the ground. Leaves as in species. Annual growth about 2½ inches.

The Species

Abies balsamea, Balsam Fir. Tree to 80 feet. Winter buds very resinous. Leaves rounded, dark green, barely 1 inch long. Labrador to West Virginia and Iowa.

Low-Growing Varieties

'Hudsonia'. Spreading, flat-topped, small shrub. Branchlets often bending horizontally, the leaves short, broad and appearing two-ranked; on old branches usually tightly appressed. At 17 years, 13 inches high and 23 inches wide.

'Nana'. Dense, somewhat round-topped shrub, similar to 'Hudsonia' when young. Branchlets more erect; leaves short, dark green, on new shoots appearing to be radially arranged; on older branches, two-ranked. Annual growth about 1 inch.

The Species

***Abies lasiocarpa,* Rocky Mountain Fir.** Tree to 100 feet or more. Branchlets with short reddish-brown hairs. Buds resinous. Leaves crowded, pointing forward and upward, 1½ inches long, pale bluish-green. Alaska to Oregon, Utah and New Mexico.

Low-Growing Variety

'Compacta'. Slow-growing, broadly conical shrub, branching rather symmetrically. Branches corky, grayish-whitish. Leaves crowded, silvery-blue. Annual growth about 2 inches.

The Species

***Abies nordmanniana,* Nordmann Fir.** Narrowly pyramidal tree to 150 feet. Leaves 1¼ inches long, dark green above, densely set on branchlets. Buds pointed, not resinous. Caucasus, Asia Minor.

Low-Growing Variety

'Pendula'. Semi-prostrate, with spreading branches and pendulous tips. Leaves glossy green. At 10 years, 12 inches high, 30 inches wide.

(*Concluded on page* 40)

'Prostrata', a variety of the noble fir, as growth starts in spring; 2 feet tall, 3 feet in width in 20 years

GIANT SEQUOIA

Botanical name of genus:
Sequoiadendron
Pronunciation: se-*quoy*-a-*den*-dron

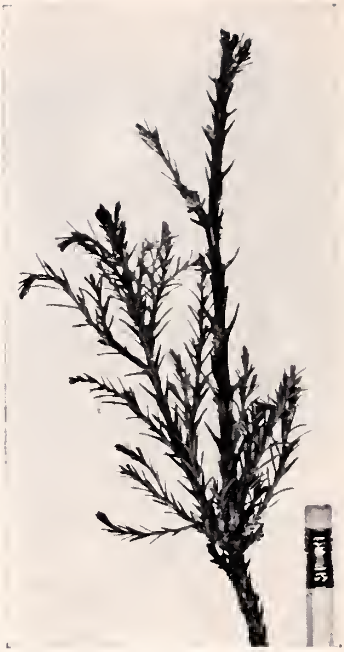
While the giant sequoia or big-tree is slightly less tall than the redwood, it is a more massive tree. It grows to nearly 300 feet in height with a trunk up to 30 feet in diameter at the base. It is native in only one area, the Sierra Nevada mountains of California, where it is protected in the Yosemite and Sequoia National Parks and other preserves.

Characteristics of the Genus

Description. Giant sequoia leaves are minute and lance-like, the largest less than half an inch long; they surround the branchlets quite tightly, clothing each one completely in green.

The pendulous cone is about 3 inches long and has scales that are greatly thickened at the outer edge. Seeds are released slowly over many years. The bark on full-grown trees may be from 10 to 20 inches thick.

There is at least one low-growing variety of interest to the horticulturist.



Branch tip of a giant sequoia

The Species

***Sequoiadendron giganteum*, Giant Sequoia** or **Big-tree.** Narrowly pyramidal tree apapproaching 300 feet in height. Leaves all narrow, sharply pointed, spirally arranged, appressed at the base with spreading tips. California.

Low-Growing Variety

'Pygmaea'. Compact, broadly pyramidal plant with ascending branches and spreading branchlets. At 20 years, 5½ feet high, 5 feet wide.

FIR

(*Continued from page* 39)

The Species

***Abies procera (A. nobilis)*, Noble Fir.** Tree to 250 feet. Leaves 1¼ inches long, 1/16 inch wide, bluish-green. Buds resinous. Washington to northern California.

Low-Growing Variety

'Prostrata'. Irregularly spreading, with more or less horizontal branches. Leaves short and broad, bluish, glaucous. At 20 years, 2 feet high, 3 feet wide.

HEMLOCK

Botanical name of genus: ***Tsuga***
Pronunciation: *tsoo*-ga

The several species of hemlock are graceful, whatever size or shape they assume. Best known is the Canada hemlock (*Tsuga canadensis*), common throughout the cold temperate portions of eastern North America. As with many trees, closely similar species grow in eastern Asia and eastern North America. Two additional species are native in western North America from Alaska southward.

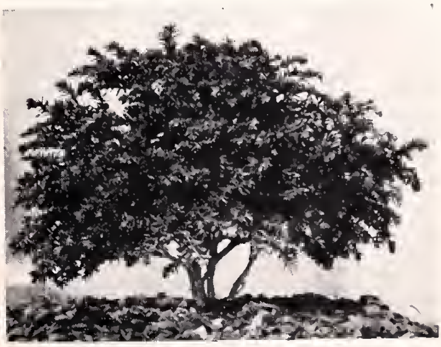
Characteristics of the Genus

Description. The main branches of hemlock are irregularly disposed. The small flat needles are lustrous. Cones are about ¾ inch long and hang from branchlets long after they have dropped their seeds.

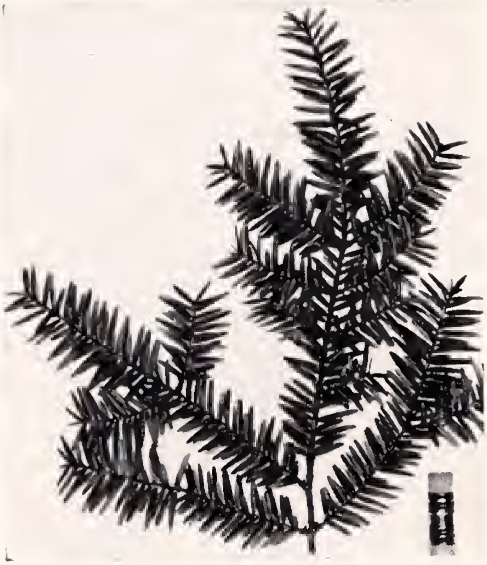
In Canada hemlock, variation in manner of growth and size has led to the discovery of many fine novelties.

The Species

***Tsuga canadensis,* Canada Hemlock.** Tall tree with slender branches and with shining dark needle-like leaves about ½ inch long irregularly arranged but mainly appearing in two opposite ranks.



'Horsford Dwarf', an 18-year-old hemlock that measures 8 inches in height



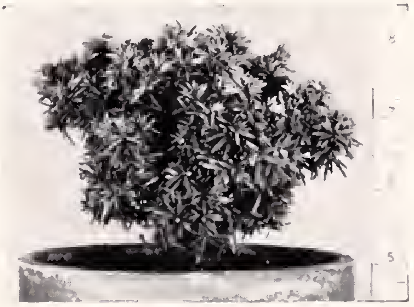
Hemlock

Low-Growing Varieties

Extreme Dwarfs

'Horsford Dwarf'. Symmetrical globe of ascending branches. The fine, short needles are closely set but not crowded. At 25 years, less than 12 inches.

minuta. This is probably the smallest of all, forming an irregular globe about as high as wide. Needles very short, but relatively broad, clustered. At 25 years, less than 10 inches high.



Montreal Botanical Garden

The Canada hemlock's variety *minuta* may reach only 3 inches in 15 years

Globes

'Cinnamomea'. Symmetrical globe of moderately crowded branches, slightly pendulous at the tips. Terminal growths thickened, covered by dense cinnamon-brown hairs. At 15 years, 20 inches high, 28 inches wide.

'Curtis Ideal'. Globose plant of symmetrical outline but with ascending branches arranged in rather irregular layers. Leaves light apple-green, not crowded. At 20 to 25 years, approximately 4 feet high, 5½ feet wide.

'Dwarf White Tip'. Initially a dense globe, becoming broadly conical with age. New spring foliage green; white in summer, later pale yellow before turning completely green the second year. At 20 years, 3½ feet high, 4 feet, 8 inches wide.

'Greenwood Lake'. Rigid, irregular globe with crowded branches, the branchlet tips somewhat recurved. The congested terminal growths are somewhat similar to those on 'Jervis' (see Pyramidal Upright Plants of slow growth, below). A plant 10 inches high, 9 inches wide is growing 1 inch per year.

'Matthews'. Rounded in outline, branches ascending, moderately crowded, becoming more spreading with age. Fanlike terminal growths somewhat pendulous. Leaves medium green, slightly crowded. At 20 years, 46 inches high, 54 inches wide.

Spreading Plants

'Bennett'. A rather flat topped plant, with branches spreading horizontally in symmetrical layers. Terminal shoots fanlike with pendent tips. Leaves medium green. At 20 years, 18 inches high, 3½ feet wide.

'Curtis Spreading'. Somewhat open, with ascending, then spreading branches. Terminal growths in a horizontal plane, with the side branches later becoming more pendulous. At 20 to 25 years, 4½ feet high, 6½ feet wide.

'Fantana'. Sometimes globose but more often spreading, with moderately crowded ascending and spreading branches. Terminal growths pendulous. Leaves bright green, closely set. At 12 years, 2 feet high, 3 feet wide.

'Silver Tip'. Somewhat spreading, with ascending branches having pendulous tips. Branchlets closely spaced but not crowded. Variegation similar to that of 'Dwarf White Tip' (see Globes, above) but the leaves do not fade to pale yellow. Annual growth to 2½ inches.

Upright, Broadly Conical Plants

'Brandley'. Dense and broad with crowded, ascending branches, the tips not pendulous. Leaves very broad and long, crowded, dark green. At 20 years, 40 inches high, 45 inches wide.

'Doran'. Compact and symmetrical cone, appearing to be sheared. Branches crowded, ascending, tips slightly pendulous. Leaves normal size (½ inch long), closely set, medium green. At 15 years, 30 inches high, 32 inches wide.

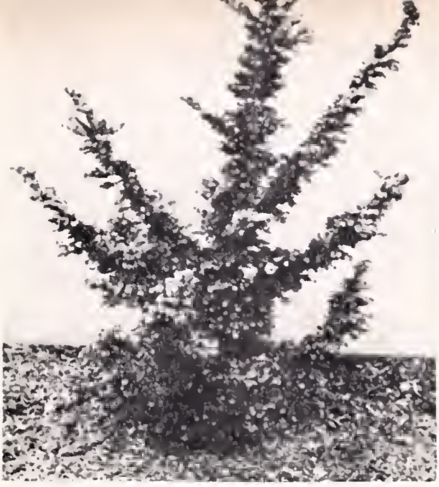
'Von Helms'. Dense, somewhat irregular, blunt-topped cone. Branches ascending, the tips slightly pendulous. Branchlets very crowded. Leaves much longer and broader than normal, very dark green. At 20 years, 31 inches high, 30 inches wide.

Pyramidal Upright Plants

(Slow growth)

'Everett's Golden ***(aurea)*****.** Compact, irregular pyramid of stiff, ascending branches and crowded branchlets. The small dense leaves are light golden-yellow in spring, greenish-yellow in summer, old gold in winter. Full sun needed to maintain the variegation. At 20 years, 4½ feet high, 3 feet wide.

◄
Canada hemlock 'Bennett', 20 years old, 1½ feet high, 3½-foot spread



'Hussi', a slow-growing Canada hemlock, 3 feet tall at 22 years

'Hussi'. Extremely irregular but upright plant of very odd growth habits. Main branches obliquely bent, many short and stubby because of the plant's habit of producing leaderless terminal growths. Branchlets short and twiggy, with small crowded leaves. At 22 years, 38 inches high, 34 inches wide.

'Jervis'. Compact, somewhat irregular pyramid with rigid ascending branches. Branchlets crowded, arranged irregularly. Terminal growths congested, winter buds thickened, producing a cockscomb effect. Leaves medium green, short and crowded. At 20 years, 29 inches high, 22 inches wide.

'Lewis'. Very irregular pyramid of rather stiff growth. Branches somewhat sparse but branchlets crowded. Leading shoots prominent, with erect, tightly appressed leaves. Leaves dark green, broad and long, crowded. At 12 years, 27 inches high, 20 inches wide.

'Taxifolia'. Rather loose in growth with several leaders, giving the general appearance of a yew (*Taxus*). Flexible, arching branches with pendulous tips. Branchlets widely spaced. Leaves medium green, long, irregular in direction. At 20 years, 44 inches high, 35 inches wide.

Pyramidal Upright Plants
(Moderate growth)

'Atrovirens'. Irregular broad pyramid with stiffly ascending branches, the tips not pendulous. Branchlets short, crowded, inclined to droop. Leaves closely set, medium green, with a characteristic yellowish margin or tip. At 20 years, 5½ feet high, 4½ feet wide.

'Boulevard'. Somewhat irregular pyramid, one of the darkest of dark green varieties. Crowded branches curve upward in wide arcs, their tips only slightly pendulous. Branchlets crowded, becoming pendulous at maturity. At 10 years, 4 feet high, 3½ feet wide.

'Fremdii'. Compact, symmetrical pyramid with one leader. Branches crowded. Leaves dark green and thick. Initially difficult to grow, but when established noted for resistance to cold and wind. At 10 years, approximately 2 feet high or less.

'Geneva'. Narrow pyramid of ascending branches with slightly pendent tips. The closely set, dark green leaves are longer than normal. At 20 years, 7 feet tall, 4 feet wide.

'Stranger'. Compact pyramid, usually with two leaders. Branches rather stiff and ascending. The long, dark green needles are heavier than normal. At 20 years, 7½ feet high, 4½ feet wide.

'Towson'. The darkest green variety among the pyramids. Branches stiffly ascending, their tips only slightly recurving. Branchlets short and very crowded. Leaves long and broad, densely set. At 20 years, 8 feet high, 4 feet wide.

Prostrate and Pendulous Plants

'Cole's Prostrate'. The only truly prostrate form, with branches and branchlets fanning out in all directions, flat upon the ground. The center of the plant characteristically becomes bare, revealing the twisted branching structure. Old plants form prostrate mats, 4 feet or more wide.

'Cole's Sport'. At first a tiny ball of tightly packed foliage, with branches gradually lengthening horizontally, forming a low, dense mat. Originated as a bud sport on an old plant of 'Cole's Prostrate'. At 14 years, 3 inches high (or thick), 9 inches wide.

(*Concluded on page* 44)

HIBA ARBORVITAE

Botanical name of genus: ***Thujopsis***
Pronunciation: thoo-*yop*-sis

The resemblance is close between the single Japanese species known as Hiba arborvitae and the arborvitaes of the genus *Thuja*. But the Hiba is considerably less hardy.

Characteristics of the Genus

Description. The branchlets of the Hiba arborvitae spread in horizontal planes, and are fan-shaped, much like those of plants in the genus *Thuja*. The small, flat leaves, though only ¼ inch long, are larger than in species of *Thuja*, and are prominently marked with white on the lower surface. The cones are about ½ inch long and are woody and broad.

The Hiba arborvitae is naturally slow growing. Its dwarf varieties are even slower.

The Species

***Thujopsis dolabrata*, Hiba Arborvitae.** Pyramidal tree, usually 30 to 45 feet, with spreading branches. In its varieties it may be extremely tall, or shrubby. Japan.

Low-Growing Varieties

'Nana'. Extremely slow-growing plant with slender branches. Leaves about ⅛ inch long, lustrous green. At 50 years, 2 feet high, 8 feet wide.

'Variegata'. Slow-growing shrub with ascending and spreading branches. Tips of some branchlets creamy-white. Annual growth about 2 inches.

* * *

HEMLOCK

(*Continued from page* 43)

'Contorted'. Irregular mound of semipendulous branches. Branchlets crowded, bent angularly downward and curving snakelike, partially straightening the second year. Annual growth variable, from 1 to 5 inches.

J. E. Downward

Sargent weeping hemlock drooping over a low stone wall in England.

'Elm City'. Semi-weeping and asymmetrical, with slightly contorted, arching branches. Branchlets more or less pendulous. Leaves crowded, small, medium green. Tiny cones produced in broad, tight clusters. At 18 years, 15 inches high, 4 feet wide.

'Gable Weeping'. Upright but with strongly weeping terminal growths. The branches arch slightly upward, then the terminal branchlets droop in a series of symmetrical clusters.

'Minuta Pendula'. Weeping and semiprostrate, suggesting a small version of Sargent weeping hemlock. Slow growing and compact, with dark foliage. At 20 years, 12 inches high, 30 inches wide.

***pendula* (Sargent Weeping Hemlock).** One of the tallest of the weeping forms, reaching a height of 10 feet or more. An irregular and picturesque plant, with pendulous branches and branchlets. Leaves medium green. Seedlings are also pendulous, but vary somewhat in manner of growth.

JUNIPER

Botanical name of genus: ***Juniperus***
Pronunciation: joo-*nip*-e-rus

Junipers are among the few groups of conifers that include shrubs as well as trees among their species. Even those that are naturally low growing have variants which never reach the stature of the species from which they have come. Some of the naturally occurring kinds have pendulous, trailing or creeping branches which give them greater breadth than width.

Characteristics of the Genus

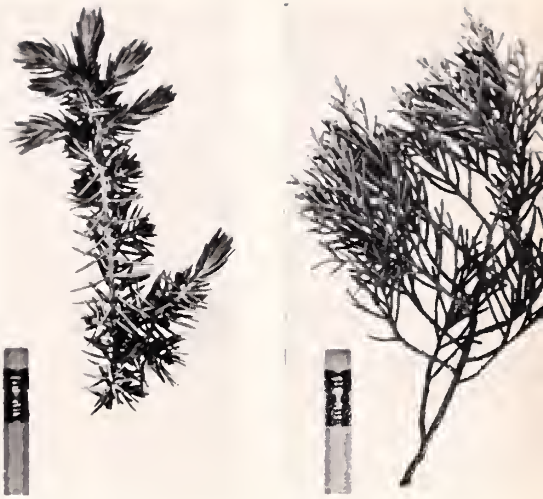
Description. Leaves of junipers are of two main kinds; one fine and sharply pointed, the other flat and scale-like. In some species and varieties, the spinelike leaves remain throughout life; in others, the scale-like leaves are dominant. In many kinds, both types of leaves are present, more or less indiscriminately. A third kind, called semi-juvenile, occurs particularly in varieties of *J. horizontalis.*

The small berry-like structure (brownish or blue) which contains the seeds of juniper starts life like a minute cone. The cone scales slowly become fleshy until at length they are united in one body, their original form completely obscured.

Some of the low-growing variants may have been derived as bud mutations, whereby a plant develops an odd branch whose peculiarities can be perpetuated by grafting or by rooting cuttings. Others have come from variations occurring as seedlings.

The Species

***Juniperus chinensis,* Chinese Juniper.** Tree to 60 feet or more. Branches ascending, branchlets slender. Leaves of two kinds: spinelike ones, somewhat spreading, and scale-like leaves held tightly against the branchlets. Both kinds on the same plant. Male and female "flowers" on separate trees, sometimes useful in identification. China, Japan, Mongolia. A variable species with many garden forms.



Twigs of juniper. *Left:* the shore juniper of Japan (*J. conferta*) which bears only spinelike leaves; *right:* the common red-cedar (*J. virginiana*) with mostly scale-like leaves

Low-Growing Varieties

Compact Bushy Plants

(Height and width nearly equal)

'Globosa'. More or less globe-shaped, with crowded, ascending branches, some curving at the tips. Leaves bright green, mainly scale-like, with acicular, or spine-like, leaves usually confined to the base. At 32 years, 3 feet high, 4 feet wide.

'Globosa Aurea'. Similar to 'Globosa' but sometimes flat-topped. Leaves medium green, lightly flecked with creamy variegation.

Low Spreaders

(Width usually greatly exceeding height)

'Expansa'. Flatly spreading bush of

Chinese juniper 'Expansa', with a spread of $2\frac{1}{2}$ feet in 10 years

compact habit. Glaucous blue, mostly spinelike leaves, splashed with gold variegation. At 10 years, 8 inches high, 30 inches wide.

'Japonica'. Dense larger growing shrub with spreading, ascending branches, sometimes twisting and turning, also bending. Leaves bright green, spinelike needles confined mostly to inner growths, scale needles on outer. At 16 years, 3 feet high, 5 feet wide.

'Parsoni'. Thick, rigid, horizontal branches spreading in all directions. Foliage glaucous and massive. Scale leaves dominate, mostly on outer growths. At 10 years, 13 inches high, 40 inches wide.

'Parsoni Variegata'. Almost identical with 'Parsoni' but splashed with creamy variegation.

'Pfitzeriana'. Probably the best known of all junipers. Wide spreading, with ascending branches and a mixture of gray-green spinelike and scale needles. At 15 years, 3½ feet high, 9 feet wide. 'Pfitzeriana Aurea', somewhat slower growing, has golden terminal growths; 'Pfitzeriana Compacta' is slower growing with more acicular leaves; 'Pfitzeriana Glauca' has more bluish foliage, habit as in the type.

sargenti. Female plant with long spreading branches with ascending branchlets forming thick mats of dark or slightly grayish green. The two leaf types fairly mixed when young, the scale-like ones increasing as the plant matures. Generally 8 or 10 inches high, but may raise to 2 feet or more if obstructed in its spread.

***sargenti* 'Glauca'.** Bluish-green form of the Sargent juniper (*J. chinensis sargenti*).

Plumose Branching

Relatively long ascending primary branches densely clothed with short, crowded branchlets.

'Plumosa'. Somewhat loose shrub with long branches that ascend, plume-like, at various angles, their tips slightly nodding. Leaves green, mostly scale-like. At 10 years, 2 feet high, 3¼ feet wide.

'Plumosa Albo-variegata'. Denser in growth than 'Plumosa', with the primary branches more erect. Branchlets tips marked with creamy-white. Green leaves mostly scale-like; spinelike leaves mostly confined to the base. Slower in growth than 'Plumosa'.

'Plumosa Aurea'. Open plant with leaves golden in summer, bronze-gold in winter, on all exposed branches. Otherwise almost identical with 'Plumosa'.

'Plumosa Aureo-variegata'. Habit almost identical to the white variegated form, but even slower in growth, with the deep golden variegation quite pronounced.

'Plumosa Aurea Nana'. Low and broad, smallest of the 'Plumosa' forms. Dense compact little shrub with bright golden foliage in the summer, slightly bronze gold in the winter, the shaded growth green. Primarily scale leaves on the outer growths. Sometimes known as 'Shimpaku Aurea Nana'. At 23 years, 17 inches high, 27 inches wide.

Upright Plants

(Height exceeding width)

'Aurea'. Male plant. Dense pyramidal shrub bearing spinelike and scale leaves equally. Leaves bright gold throughout the year, with inner, or shaded, growth green. At 35 years, 9 feet high, 6 feet wide.

'Blaauw's Variety'. Dense, compact, semi-erect shrub of irregular shape with some resemblance to the plumose varieties. Covered with primarily blue-gray scale leaves tinged purplish in winter. At 20 years, 5 feet high, 2½ feet wide.

'Pyramidalis'. Male plant, very slow-growing, with rather wide-spreading, spinelike leaves. The glaucous white bands on their inner surfaces lend the shrub a bluish appearance. Scale leaves generally lacking. At 18 years, 5½ feet high, 3 feet wide.

The Species

***Juniperus communis,* Common Juniper.** Variable species, appearing both as a shrub and as a narrow tree to 40 feet. Leaves all spinelike, green or grayish-green. Europe, northeastern Asia and North America.

J. E. Downward

'Echiniformis', a slow-growing dwarf variety of the common juniper, used as a pot plant

Low-Growing Varieties

Low, Compact, Bushy Plants

'Echiniformis'. Humped, almost globular bush. Leaves dark green, rather long, spreading and prickly, hence the common name hedge-hog juniper. Size, 1 to 2 feet high and not much wider.

'Hemisphaerica'. When young, scarcely distinguishable from 'Echiniformis', but with age broader, more mound-like and quite spreading in outline. An old specimen, about 35 years, measured 18 inches high, 30 inches wide.

'Nana'. Compact little bush of semi-prostrate habit with erect branchlets showing to advantage the bright blue-white inner surface of the small leaves. The outer surfaces become bronze-green in winter. At 10 years, 6 inches high, 11 inches wide.

Spreading Plants

depressa. Dense, spreading shrub, with ascending growth. Needles green, bronze-green in winter, contrasting effectively with the bright blue-white inner surfaces. A native North American variety. Old specimens have reached 4 feet high with a greater spread.

***depressa* 'Aureo-spica'.** Rather flat, loose bush with wide-spreading ascending branches. New leaves bright gold, gradually turning green during the season, but with upper surfaces and tips remaining brightly colored. These turn deep bronze-gold in winter and finally green the second year. At 11 years, 14 inches high, 3 feet wide.

'Golden Vase-shape'. A truly vase-shaped plant with branches ascending and flaring outward. Foliage identical in color to 'Aureo-spica' (*left, below*) but blue-white bands on inner leaf surfaces showing prominently. At 15 years, 2 feet high, 4 feet wide at top.

'Effusa'. Low spreading plant with slender, arching branches. The small leaves are held lightly along the shoots, their blue-white bands quite concealed. Purplish-bronze in winter. At 10 years, 10 inches high, 26 inches wide.

'Hornibrookii'. Initially a ground-hugging prostrate mat, but tending to rise with layered branches having somewhat pendulous tips. The small leaves have conspicuous white bands and are densely crowded on the branches. Reaches about 2 feet high and 6 to 7 feet wide.

Upright Plants

'Columnaris'. Very narrowly columnar, with leaves irregular in size and arrangement. Frequently distributed as 'Compressa', but differing chiefly in ultimate size and rate of growth, reaching 3 feet in height when 'Compressa' is barely 1.

'Compressa'. Small columnar plant,

'Compressa', a fastigiate common juniper, less than 2 feet in 18 years rarely growing over 3 feet tall. Densely ascending branches and branchlets. Little leaves, spreading and showing their glaucous inner surfaces. Annual growth 1 inch or less.

***suecica* 'Nana'.** Dwarf columnar plant of compact growth with ascending branches and branchlets. When young, somewhat like *Juniperus communis* 'Compressa' (above) in general appearance, becoming more blunt-topped with age. Leaves green with blue-white bands. At over 30 years, about 5½ feet tall.

The Species

***Juniperus horizontalis,* Creeping Juniper.** Trailing or procumbent shrub, the main branches prostrate, the branchlets ascending or erect. Leaves blue-green to glaucous blue, scale leaves dominant. Southern Canada and northern United States west to Montana.

Low-Growing Varieties

'Alpina'. Low shrub appearing upright when young but later developing spreading branches with ascending branchlets. Small spinelike leaves, somewhat glaucous, with a slight purplish tinge in winter. At 25 years, 2 feet high, 5 feet wide.

'Glomerata'. Low, wide-spreading plant with prostrate stem from which ascend short branches crowded at the tips into clusters of very short branchlets. Tinged purple in winter. At 18 years, 6 inches high, 40 inches wide.

'Procumbens'. Initially a prostrate mat, with the branches tending to twist, gradually rising in irregular layers. Branchlets very short, slightly ascending. Leaves deep blue-green, mostly spinelike, scale needles sometimes developing later on tips. At 22 years, 14 inches high, 3½ feet wide.

Other excellent low-growing or creeping varieties of *J. horizontalis,* most with bluish, blue-green or blue-gray foliage tinged purplish in the winter, include:

'Wiltoni', the carpet juniper, an especially flat, wide-spreading variety of the creeping juniper

'Bar Harbor', which follows the contour of the ground and can form thick mats, the foliage steel blue.

'Douglasi', Waukegan Juniper, which makes a dense mat with its trailing stems with ascending branchlets.

'Plumosa', Andorra Juniper, higher in growth, with plumelike branchlets, up to 2 feet high and 6 feet wide at 16 years.

'Wiltoni', Carpet Juniper, very flat and spreading.

The Species

Juniperus procumbens. Prostrate plant with wide-spreading branches. The bluish-green leaves are always spinelike and in 3's. Reaches a height of 1½ to 2½ feet in 8 years.

Low-Growing Variety

'Nana'. Creeping, very densely branched plant often confused when young with *Juniperus squamata* 'Prostrata'. The characteristics usually advanced for identification are somewhat variable and occasionally appear in both plants. The more reliable characteristics are outlined under *J. squamata* 'Prostrata'.

The Species

***Juniperus sabina,* Savin Juniper.** An old, well-known species, cultivated in Europe for about 400 years. Widely distributed in central and southern Europe, east to Siberia. Usually a low plant with arched branches, seldom exceeding 6 to 8 feet. Foliage of both types. Male and female "flowers" occur on different plants.

Low-Growing Varieties

'Arcadia'. Dense bush of semi-spreading habit, similar to 'Tamariscifolia' (*right*) but lower, with short slender branchlets heavily clothed with green to gray-green, mostly scale leaves, with a rather fine and lacy texture. At 10 years, 1½ feet high, 3½ feet wide.

'Buffalo'. Also similar to 'Tamariscifolia' but an improvement over it, with feathery green foliage and flatter growth.

'Grey Owl'. Spreading bush with ascending branches and very fine branchlets. Silver-gray foliage, both spinelike and scale, with color retained throughout the winter. At 10 years, 2 feet high, 3 feet wide.

'Scandens'. A very low form of spreading habit. Leaves of two kinds, with the well defined glaucous markings lending it a silvery-green appearance. At 10 years, 8 inches high, 4 feet wide.

Roche

Juniperus procumbens 'Nana'

Savin juniper 'Tamariscifolia', which has grown about an inch in height each year for 20 years

'Tamariscifolia'. Spreading compact plant with mostly spinelike leaves, having a rather fine, lacy appearance. At 8 years, 12 inches high, 34 inches wide.

The Species

***Juniperus scopulorum*, Rocky Mountain Juniper.** Hardy tree reaching 30 to 35 feet. Somewhat similar to *Juniperus virginiana*. Rocky Mountains from British Columbia to California.

Low-Growing Varieties

'Repens'. Creeping plant with silvery, pale green foliage, the branches in long feathery sprays. Changes to pale violet-blue in winter.

'Silver Star'. Wide, low-growing shrub of spreading habit. Young growths at first vivid light green, soon becoming silvery. Slowly reaches 12 to 15 inches high, 4 feet wide.

'Table Top Blue'. Densely branched, spreading, flat-topped plant with very slender terminal growths protruding from the top. Silvery blue-gray leaves, the color retained throughout the year. At 8 years, 30 inches high and wide.

'White's Silver King'. Spreading, compact, mound-shaped plant with extremely glaucous silvery-blue foliage. New growth is pale green, soon becoming glaucous. In 6 years spreads to 4 feet wide.

Rocky Mountain juniper 'Table Top Blue', 20 inches in height and breadth in 8 years

The Species

Juniperus squamata. Prostrate shrub with decumbent branches and ascending branchlets. Leaves always spinelike, in threes. Himalayas, China and Formosa.

Low-Growing Varieties

'Campbellii'. An upright shrub, very similar to 'Loderi', but with leaders dividing obliquely, their tips recurving. Rate of growth the same but the plant appearing wider because of spreading leaders.

'Loderi'. Bushy, fastigiate juniper of very symmetrical outline. The terminal shoots are stiffly erect, but the slightly recurving branches lend it a rather soft effect. Has a glaucous appearance due to the conspicuous white bands on the spreading leaves. At 15 years, 30 inches high, 22 inches wide. Fruits at this age.

'Meyeri'. A picturesque upright form somewhat conical when young. The leaves point upward. They are a glaucous blue-green with bluish bands and turn brownish in winter, but the bloom causes the brown to appear somewhat pinkish violet. At 32 years, about 11 feet high and wide.

'Prostrata'. Low spreading plant somewhat similar to *Juniperus procumbens* 'Nana'. These two plants seem much the same when young, but the youngest branchlets of 'Prostrata', viewed from the lower side, are thickish and greenish-white, the leaf bases appear swollen, and the white markings on the needles look fuzzy. In *J. procumbens* 'Nana', the branchlets are slender and appear blue-green on the lower side. Later, the terminal shoots of 'Nana' tend to tip up, off the ground, those of 'Prostrata' to lie flat.

The Species

Juniperus virginiana, **Red-cedar.** Columnar tree, of diverse branching habit, eventually growing to 90 feet, often becoming loosely branched. Both scale and spinelike leaves usually present. Eastern North America.

Low-Growing Varieties

'Globosa'. Dense plant with a symmetrically rounded top. Branches ascending and spreading, the terminal growths rather congested. Leaves primarily scale-like, but some green spinelike leaves present. At over 30 years, 4 feet high and wide.

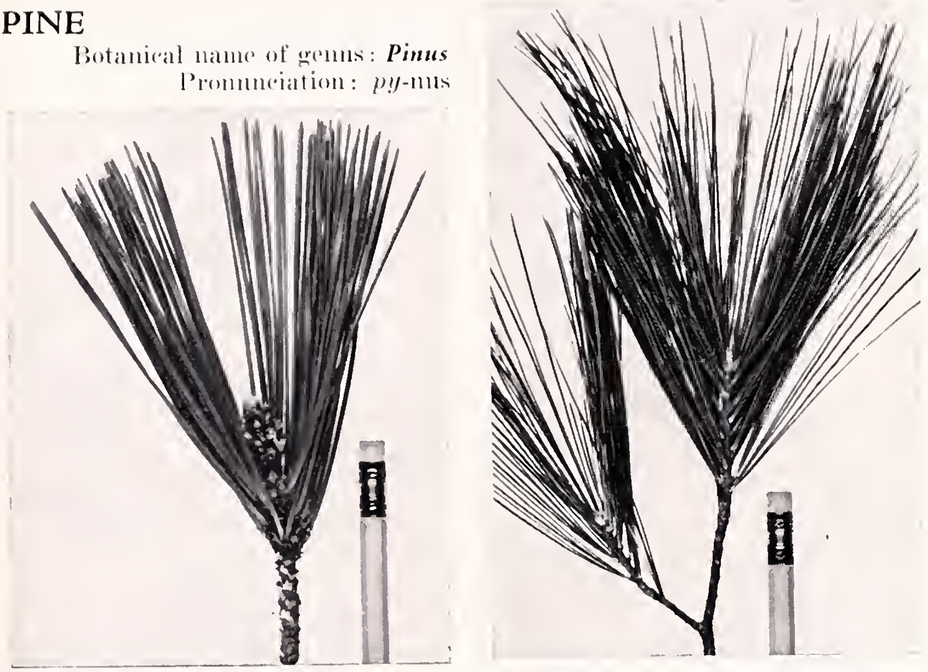
'Reptans'. Very slow-growing prostrate plant with fine foliage and also very fine, stringlike, prominent branchlets. The few spinelike needles are confined to the interior, all of the outer ones being green and scale-like. At 20 years a specimen with the leader staked is 16 inches high, 21 inches wide.

'Tripartita'. Spreading shrub varying from semi-erect to a sprawling type much wider than high and open-centered. Leaves deep green, rather fine in appearance. At over 30 years, about 5 feet high, 8 feet wide.

Variety 'Prostrata' of the Asiatic *Juniperus squamata;* an 8-foot spread in 18 years

PINE

Botanical name of genus: ***Pinus***
Pronunciation: *py*-nus



Branch tips of pine. *Left:* the two-needle Japanese black pine (*Pinus thunbergi*); *right:* the five-needle eastern white pine of the United States (*P. strobus*)

Pines are among the few Northern Hemisphere conifers that extend to the equatorial zone; they reach the Malaysian Archipelago. In the New World, pines grow in Guatemala and the West Indies. The northern limits of the genus are within the Arctic Circle. Of the 80 or more species known, some 40 are horticulturally useful plants of the temperate zone.

Characteristics of the Genus

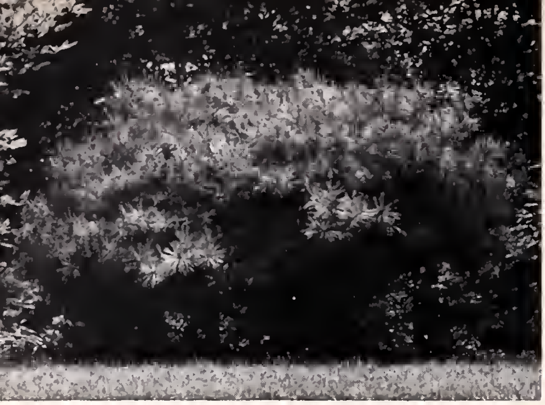
Description. The different kinds of pines are primarily distinguished by the number of needles that occur together. In the familiar eastern white pine (*Pinus strobus*) there are always five in a cluster. In the Japanese red pine (*P. densiflora*) there are always two together. Others have three or four in tight bundles. In most pines the needles are long and soft to the touch. Except for the shrubby mugo pine (*Pinus mugo*) of the Alps and adjacent mountains, most pine species are tall trees.

Bud mutation and seedling variation have resulted in a large number of low and slow-growing pine varieties of ornamental value. One has been propagated from a witch's-broom (a dense growth of branchlets on one portion of a plant). Its slow, compact growth (6 feet tall in 40 years) gives assurance that it will remain relatively dwarf in stature throughout its life.

Two-needle Pines

The Species

***Pinus densiflora*, Japanese Red Pine.** Tree 70 to 120 feet high with an irregular broad head, trunk frequently leaning or crooked. Leaves 3 to 4½ inches long. Japan.



Avery

'Nana', a dwarf eastern white pine 4 feet high, about 25 years old

Low-Growing Varieties

'Globosa'. Rounded, spreading shrub. The trunk is semi-prostrate at first. Leaves 2½ to 3 inches long. At 50 years, about 15 feet high (Rochester, N. Y.).

'Oculis Draconis', Dragon's-eye Red Pine. Irregular, upright pyramid. Leaves green, marked with white or pale yellow zones which change to old gold in winter; turning entirely green the second year. At 20 years, 6 feet high, 4 feet wide.

'Prostrata'. Main stem bends like a knuckle and the completely prostrate branches follow the contours of the ground. Leaves green, about 3 inches long. At 20 years, 1 foot high, 5 wide.

'Umbraculifera', Umbrella Pine (but not to be confused with *P. pinea,* a tall tree of the Mediterranean region, nor with *P. strobus* 'Umbraculifera' p. 54). Round bushy mound which later becomes a small multi-stemmed tree with an umbrella-shaped crown. The red, exfoliating trunk of old plants is conspicuous. At 75 years, 13 feet high, 15 feet wide.

The Species

***Pinus mugo,* Mountain Pine.** Native of Europe with four geographical races ranging from trees 30 to 80 feet tall (varieties *rostrata* and *rotundata*) to small bushy shrubs (varieties *mughus* and *pumilio*) from which the dwarf garden forms are derived.

Low-Growing Varieties

'Compacta'. Dense, rounded shrub, wider than high. Branches crowded and ascending. Leaves slender, less than 1½ inches long, dark green. At over 40 years, 4 feet high, 5 feet wide.

'Gnom' ('Gnome'). Irregular, flat-topped mound, wider than high. Branches crowded, ascending and spreading. Leaves less than 2 inches long, deep green, spreading symmetrically around the shoots. At 25 years, 15 inches high, 36 inches wide.

'Slavinii'. Low dense mat of short erect branches. Leaves short, crowded, lustrous dark bluish-green. At more than 40 years, 3 feet high, 5 feet wide.

The Species

***Pinus nigra,* Black Pine.** Tree to 150 feet, best known in its geographical variety *austriaca,* Austrian pine. Leaves about 4 inches long, dark green. Central and southern Europe and Asia Minor.

Low-Growing Variety

'Hornibrookiana'. Shrubby and spreading with stout, ascending branches. Leaves crowded, about 4 inches long, lustrous dark green. Originated as a witch's-broom on Austrian pine. At 45 years or more, 6 feet high, 12 wide (Rochester, N. Y.).

The Species

***Pinus sylvestris,* Scots Pine.** Picturesque tree, 80 to 100 feet, with reddish bark. Leaves 1½ to 3 inches long, rigid, somewhat twisted, grayish- or bluish-green. Eurasia.

Japanese white pine 'Bergman', 1½ feet tall in 15 years

Eastern white pine 'Prostrata'. While this variety ordinarily grows flat on the ground, it may be staked up as shown

Low-Growing Varieties

'Aurea'. Upright, somewhat irregular pyramid. Leaves rather fine, 1 to 1½ inches long, soft green in summer, brilliant gold in winter. At 30 years, 18 feet high, 10 feet wide. Annual growth about 2 inches.

'Beauvronensis'. Densely-branched little mound. Leaves green and slightly twisted, only ½ inch long. At 25 years, 21 inches high, 30 inches wide.

'Compressa'. Narrowly fastigiate, the sparingly produced branches held closely against the main stem. Branchlets short and stiff. Leaves bluish-green, relatively broad, about 2½ inches long, densely crowded on current year's growth. At 15 years, 36 inches high, 11 inches wide.

'Pumila'. Rounded to broadly pyramidal bush. Branches semi-erect, needles very bluish-green, stiff and twisted, to 1½ inches long. Annual growth 2 inches.

'Pygmaea'. Dense globe. Branches shiny red, ascending and then spreading. Leaves medium green, less than 1 inch along the branchlets, longer and crowded at branch tips. At 15 years, 10 inches high, 17 inches wide.

'Saxatilis'. Spreading and flat-topped with dense mat-like growth. Branchlets slender and crowded. Leaves about 1 inch long, fine and twisted, dark bluish-green. At 16 years, 6 inches high, 20 inches wide.

'Watereri'. Almost identical to 'Pumila', but possibly more dense and of slightly faster growth. At 25 years, 13 feet high, 12 feet wide.

Five-needle Pines

The Species

***Pinus parviflora*, Japanese White Pine.** Picturesque, spreading tree, 40 to 75 feet in height. Leaves 2 to 3 inches long, bluish-green with conspicuous white lines. Japan.

Low-Growing Varieties

'Brevifolia'. Low open pyramid or a rounded bush, the foliage compressed and dense on current season's growth. Leaves ¾ inch long, thick and curved, densely spaced, blue-green on the outside, whitish on the inner surface. Annual growth about 1½ inches.

'Bergman'. Spreading, rounded shrub with many leaders of equal size. Leaves 2½ inches long, bluish, twisted. The erect winter buds are up to 1¼ inches long. This seedling shows characteristics of both the Japanese and the Korean white pines. At 15 years, 17 inches high, 36 inches wide.

The Species

***Pinus strobus*, Eastern White Pine.** Pyramidal tree, 80 to 150 feet tall, with slender branchlets. Leaves slender and soft, 3 to 7 or 8 inches long, bluish-green. Northeastern United States and adjacent Canada.

Low-Growing Varieties

'Contorta'. Rather open, irregular pyramid, with slightly twisted branches and branchlets. Leaves green, 2 inches long, curled and twisted. Annual growth about 4 inches. A plant over 40 years old is 18 feet high.

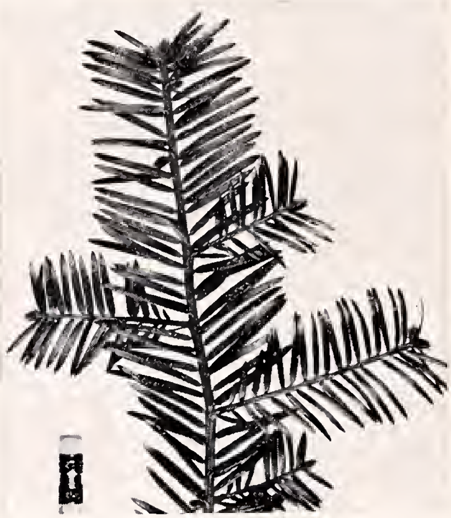
'Minima'. Dense, low and spreading, wider than high. Branchlets slender, crowded and quite uniform in length. Leaves only 1 inch long, fine and stiff, dark green with very conspicuous bluish-white lines on inner surfaces. Annual growth about 1 inch.

(*Concluded on page* 54)

PLUM-YEW

Botanical name of genus:
Cephalotaxus
Pronunciation: sef-al-o-*tax*-us

This small group of conifers consists of moderate-sized trees that are native to Japan and China. In general appearance they are like large-leaved yews.



Branchlet of plum-yew

Characteristics of the Genus

Description. Instead of cones, the plum-yews bear plum-shaped, fleshy fruits about an inch long. The needles are an inch or more long, sharp pointed, green above with a prominent midrib, whitish beneath. As in yew, the needles occur in two opposite ranks.

Plum-yew 'Pedunculata Prostrata', 3 feet wide, 15 years old

Among these naturally small trees, a few varieties are so much smaller, slower growing and more compact that they rate as dwarfs.

The Species

***Cephalotaxus drupacea,* Plum-Yew.** Spreading tree, 20 to 30 feet. Leaves 1 to 2 inches long, in semi-erect ranks. Japan.

Low-Growing Varieties

'Fastigiata'. More or less columnar. Branches few, upright or nearly so. Branchlets crowded. Leaves dark green, to 2½ inches long, radially arranged. At 20 years, 3½ feet high, 18 inches wide.

'Pedunculata Prostrata'. A low, flexible shrub with radiating, semi-prostrate arching branches. Leaves broad, dark green, in two ranks. At 15 years, 20 inches high, 36 inches wide.

PINE

(*Continued from page* 53)

'Nana'. Bushy, irregular pyramid, becoming more open, developing one or more leaders. Leaves about 2 inches long. At 75 years, 16 feet high.

'Prostrata'. Prostrate, the branches trailing. Leaves green, 5 to 6 inches long, in drooping clusters. When the main stem is tied up to form a leader, growth accelerates and the branches become pendulous. A staked plant, more than 20 years old, is 8 feet high and 7 feet wide.

'Pumila', Roundish plant, with central shoot of each cluster tending to elongate. Leaves light green, uniformly about 3¼ inches long, fine and somewhat twisted. Annual growth 2 to 3 inches.

'Radiata'. Tufted, rounded, spreading shrub. Branchlets crowded, more or less regular in length. Winter buds rounded. Leaves of more than one size, the longest, about 2½ inches, at tips of twigs, the shorter ones growing about half way down. At 25 years, 2½ feet high, 3 feet wide.

'Umbraculifera'. Wide-spreading, somewhat vase-shaped shrub. Branchlets crowded. Leaves light green, about 3½ inches long. Leaf clusters drooping. Similar to *Pinus densiflora* 'Umbraculifera'.

REDWOOD

Botanical name of genus: ***Sequoia***
Pronunciation: se-*quoy*-a

These are the world's tallest trees; some of the redwoods of coastal California and southern Oregon tower to 300 feet or more.

Characteristics of the Genus

Description. On the lateral shoots of redwood the leaves are sharp-pointed, flattened needles ½ to ¾ inch long, arranged in two ranks. The branches from which these shoots arise are covered with tightly overlapping scale-like leaves. The cones on these enormous trees are barely an inch long. The bark is very thick, deeply furrowed and reddish.

Several sequoia dwarfs of prostrate habit measure only a few feet in height. One has short leaves that are proportionately almost too broad to be called needles. It arose as a bud mutation and has since been propagated.

For the giant sequoia or big-tree (*Sequoiadendron*) of the Sequoia National Park and adjacent areas, see page 40.

The Species

Sequoia sempervirens, **Redwood.** Narrow pyramidal tree of unprecedented height, with extremely thick, heavily ridged, reddish bark. Native only in coastal California and southern Oregon.

Low-Growing Varieties

'Adpressa'. Spreading or prostrate shrub, occasionally producing a leader which should be removed. Leaves mostly 2-ranked, barely ½ inch long. Young tips creamy-white, older leaves bluish-grayish-green. Annual growth 2½ to 3 inches.

'Prostrata' ('Cantab'). Almost creeping, with prostrate branches and partly ascending branchlets. Leaves short and broad, grayish-bluish, 2 ranked. At 12 years, 3 feet high, 7 feet wide. Originated as a bud-sport at the Cambridge Botanical Garden in England.

Redwood twig

Dwarf redwood 'Prostrata' in an English garden *J. E. Downward*

SPRUCE

Botanical name of genus: ***Picea***
Pronunciation: *py*-se-a

Spruce trees abound from the Arctic Circle to the warm temperate regions of the Northern Hemisphere. Toward their southern limits they are found only in the higher mountains. About two-thirds of the 40 or more species are native in Asia; most of the others occur in North America. Two spruces that are of special horticultural interest come from Europe—the Norway (*Picea abies*) and the Serbian (*P. omorika*).

Characteristics of the Genus

Description. Spruce needles are short, stiff, angular, pointed, and sharp to the touch. They grow all around the branchlets. The more or less cylindrical cones remain hanging from the branches for several years.

The Norway spruce (*Picea abies*) is one of the most variable of all conifers. In contrast to its possible height of 150 feet, some of the dwarf varieties that have come from it are low mounds whose height can be measured only in inches. On some of these the annual growth is an inch or less.

Tip of spruce branch

The fact that many dwarf spruces have appeared as seedlings shows genetic instability in the group. In other words, the seed of a forest giant does not necessarily produce another forest giant; almost anything can happen. Other low- and/or slow-growing spruces of unusual shape or habit have undoubtedly arisen through bud mutations, as when a branch has developed in an unpredictable manner. These small spruces of unusual size and habit are occasionally used by garden designers.

The Species

***Picea abies (P. excelsa),* Norway Spruce.** Pyramidal tree to 150 feet with spreading branches. Branchlets on mature trees pendulous. Winter buds not resinous. Needles about 1 inch long, dark green. Northern and central Europe.

Low-Growing Varieties

Compact Plants
(Height and width about equal)

'Capitata'. Irregular, spreading mound, eventually becoming slightly higher than wide. Distinctive, with stout branches of equal thickness capped by tight clusters of branchlets that point in all directions. Thick radial leaves, sometimes of abnormal size or shape. At 35 years, 5 feet high, 4 feet wide.

'Crippsi' ('Brevifolia'). Globose or broadly conical bush, the branches crowded, ascending and spreading. Branchlets fine but stiff. Thin green leaves taper abruptly to hairlike points. Annual growth, 1 inch.

'Globosa'. Compact symmetrical globe. Branches crowded, the branchlets stiff and relatively stout. Prominent winter buds. Leaves medium green, fine and short, mostly $\frac{1}{4}$ inch in length. Annual growth variable, from $\frac{1}{4}$ inch to $1\frac{1}{2}$ inches.

'Gregoryana'. Low and rounded or

F. G. Meyer

Norway spruce 'Gregoryana' at the Hesse Nursery, Weener/Ems, Germany; 2½ feet tall, 40 years old

sometimes flat-topped shrub of extremely slow growth. Branches crowded and spreading, branchlets very fine. The round, needle-like leaves are radially arranged on all branchlets. Very small brown buds. At 35 years, 18 inches high, 21 inches wide.

'Nana'. Distinctive abnormal form, usually a flattened, globose bush. Crowded, ascending branches, obliquely spreading. Branchlets short and thick, some abnormally swollen. Leaves variable, very small on normal branchlets, but thick and large on others. At 35 years, 4 feet high and wide.

Spreading Plants

(Width exceeding height)

'Clanbrasiliana'. Dense, rather flat-topped bush of very crowded branches. Branchlets yellowish-white, very fine. Leaves lustrous green, widest in the middle, tapering to a fine point. Buds red-brown, prominent. At 40 years, 4 feet high, 8 feet wide.

'Maxwellii'. Spreading mound of densely crowded branches, with prominent, short, stout branchlets. Leaves coarse, medium green, ending in long hairlike points. Terminal buds prominent. At 65 years, 6 feet high, 10 feet wide.

'Minutifolia'. Dense, rather flat-topped mound. Branches ascending and spreading, branchlets crowded, short and stiff. Leaves deep green, from ⅛ to ¼ inch long. Buds prominent, red-brown. At 15 years, 6½ inches high, 9 inches wide.

'Nidiformis'. Dense spreading plant with branches and branchlets forming a series of tightly packed layers. Terminal growths in one plane, somewhat recurving. Leaves medium green, rather thin and narrow. At 50 years, 3 feet high, 5½ feet wide.

'Parsoni'. Symmetrically spreading, domed mound. Branches extend horizontally but with terminal growths ascending. Side branchlets flexible and drooping. Needles thin, lustrous green. At 20 years, 18 inches high, 4 feet wide.

'Pseudo-Maxwellii'. A low spreading mound when young, eventually assuming a beehive shape. Branches and branchlets crowded, spreading somewhat horizontally. Leaves rather flat, some with hair-like points. Buds mostly concealed. At 20 years, 12 inches high, 24 inches wide.

'Pumila'. Rounded when young, eventually a spreading humped mound, with branches in platter-like layers. Terminal growths fanlike, inclined to cup, with tips of young growths somewhat recurving. Needles thin, lustrous green. At over 60 years, 8 feet high, 12 feet wide.

'Tabuliformis'. Spreading, flat-topped mound, with branches in a series of rather widely spaced layers. Branchlets in horizontal planes. Needles yellowish-green, thin and flat. At 35 years, 3½ feet high, 5 feet wide.

J. E. Downward

A typical globose variety of dwarf Norway spruce

'Veitchii'. Low, wide-spreading mound of crowded branches and very short branchlets. Needles gray-green, arranged radially on top leading shoots and comblike on drooping side branchlets. Radial needles are short and round; others are longer and flatter. At 60 years, 4 feet high, 12 feet wide.

Upright Small Trees

(Height generally exceeding width)

'Ellwangeriana'. Usually a loose, rounded bush when young, soon becoming broadly conical. Branches ascending, with bright orange branchlets in fanlike arrangements. Needles lustrous dark green, sharp pointed, slightly curved, concealing the terminal buds. At 60 years, 10 feet high, 9 feet wide.

'Microsperma'. Narrow symmetrical pyramid with crowded ascending branches. Branchlets grayish-brown, in cupped, fan-forming arrangements, the central shoots of which are semi-erect. Needles are bright green, blunt pointed, incurved, and widest in the middle. At over 55 years, 18 to 25 feet tall.

'Mucronata'. Compact globe at first, eventually a broad cone. Branches crowded and ascending, branchlets bright orange. Terminal growths strongly cupped, the central leading shoots standing erect. Needles lustrous green, sharp pointed, of even width and slightly curved. At 25 years, 5 feet high and wide.

J. Deitch

Norway spruce 'Prostrata', a low slow-growing variety. In this specimen two branches are staked upright; a 6-foot spread in 20 years

'Ohlendorfii'. Initially a globular shrub, eventually becoming broadly conical. Branches ascending, crowded and stiff. Branchlets yellow-white; terminal growths fanlike and cupping. Leaves fine and flat, incurving at the tip. At 30 years, 6 feet high, 4 feet wide.

'Remontii'. Very slow-growing, narrowly conical, small tree with ascending branches and branchlets. Needles yellow-green, fine and soft, gradually decreasing in length from the base of the shoots to the prominent red-brown buds. At 30 years, less than 5 feet high.

Pendulous and Prostrate Plants

'Inversa'. A miniature weeping spruce. The main stem divides into numerous aberrant branches. The branchlets are completely pendulous, hanging vertically in long, thick clusters. When young the plant is thin and open, but it develops into a striking specimen with age.

'Procumbens'. Low bushy plant with wide-spreading, horizontal branches, initially lying flat on the ground. Branchlets stiff, semi-erect, pointing forward. Leaves medium to yellow-green, thin and flat. At 55 years, 3 feet high, 17 feet wide.

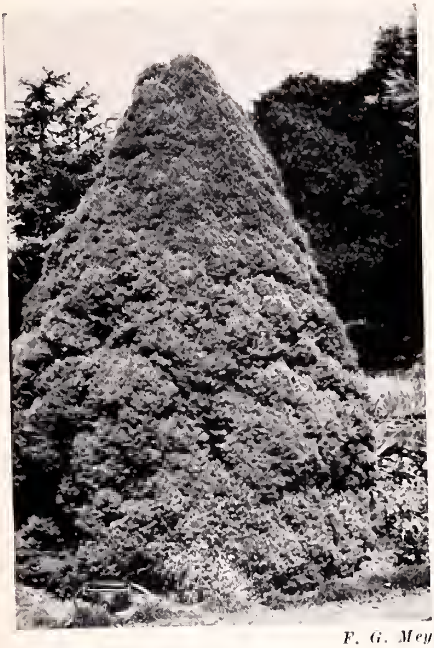
'Prostrata'. Irregular, wide-spreading plant with decumbent branching (alternately rising and then decurving). The main stem knuckles over, lying flat on the ground. Branches and branchlets fan out radially, eventually becoming decumbent in habit. At 20 years, 2½ feet high, 6 feet wide.

The Species

***Picea glauca (P. canadensis)*, White Spruce.** Densely pyramidal tree to 75 or 100 feet, with spreading or ascending branches. Needles grayish-green or bluish-green, ½ inch long. Labrador and Alaska to New York and Minnesota.

Low-Growing Varieties

***albertiana* 'Conica', Dwarf Alberta Spruce.** A narrow cone of short twiggy branches



F. G. Meyer

Dwarf Alberta spruce 12 feet tall, 40 years old, at Trompenburg, the garden of H. van Hoey Smith, Rotterdam, The Netherlands

and flexible little branchlets. Grass-green leaves over ½ inch long, very thin and fine. At 43 years, 10 feet high, 6 feet wide.

'Tabuliformis'. Flat-topped spreading plant with branches in horizontal layers. Branchlets short, gray-brown, with slightly recurving tips. Needles crowded, soft bluish-green.

The Species

***Picea mariana (P. nigra),* Black Spruce.** Slender tree, to 60 feet or more, the branches irregular, somewhat pendulous. Needles about ½ inch long, dark green. Eastern North America, Nova Scotia to mountains of North Carolina.

Low-Growing Varieties

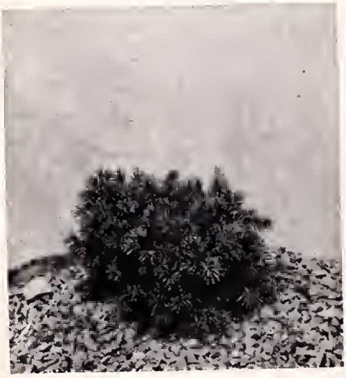
'Doumetii'. Broadly conical shrub with crowded ascending branches and branchlets. The soft, gray-green foliage is fine and needle-like, and tends to be radially arranged around the twigs.

'Ericoides'. Rounded or broadly conical shrub with very fine flexible branchlets. Leaves dark blue-green, thin and heath-like, somewhat twisted. At 41 years, 16 feet high, 15 feet wide.

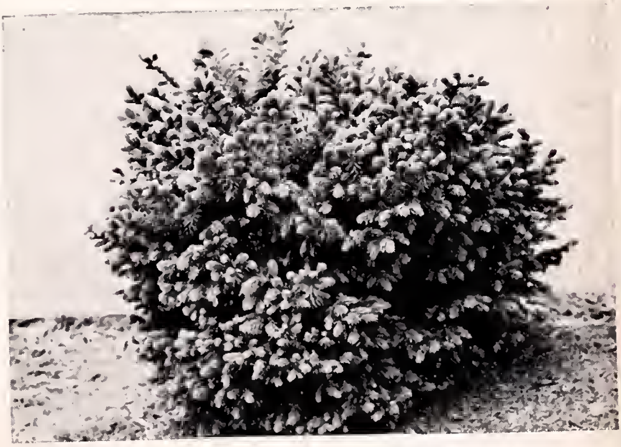
'Nana'. Irregular mound, very slow growing, bearing densely crowded branches and very short little branchlets. Very fine needle-like leaves, a somewhat lighter blue-green than on 'Ericoides'. At 15 years, 9 inches high, 12 inches wide.

The Species

***Picea omorika,* Serbian Spruce.** Narrowly pyramidal tree, to 100 feet. Branches spreading and then ascending. Branchlets pendulous. Winter buds not resinous. Needles ½ inch long, shiny dark green with glaucous bands. Eastern Europe.



Black spruce variety 'Nana', 9 inches high, 15 years old



Serbian spruce variety 'Nana', close to 1½ feet high when 10 years old

Oriental spruce 'Aurea Nana Compacta', its new growth bright golden yellow, 8 inches tall in 7 years

Low-Growing Varieties

'Expansa'. Wide-spreading, semi-prostrate shrub with decumbent branches and pendulous branchlets. Typical "omorika" foliage, with leaves pointing upward, showing the blue-white bands. At about 20 years, 30 inches high, 15 feet wide.

'Nana'. Dense, rounded mound, eventually becoming more conical. Branchlets semi-erect, showing the conspicuous blue-white bands on the inner surfaces of the flat leaves.

The Species

***Picea orientalis*, Oriental Spruce.** Tree to 150 feet with slightly pendulous branchlets Needles stout, lustrous dark green, to ⅜ inch long, crowded against the branchlets. Caucasus and Asia Minor.

Low-Growing Varieties

'Gracilis'. Densely branched, rounded to conical shrub. Branches ascending, terminal branchlets inclined to cup. Leaves very dark green, thick and short, with a blunt tip. At 30 years, 5 feet high, 4 feet wide.

'Nigra'. Open, irregular, spreading mound. Branches ascending and arching, with short, irregular, somewhat recurving branchlets. Leaves fine and small, ¼ inch or less, deep glossy green. Annual growth, 2 inches.

The Species

***Picea pungens*, Colorado Spruce.** Broadly pyramidal tree to 100 feet or more. Branches spreading straight horizontally in regular whorls. Leaves about 1 inch long, rigid and spiny pointed, bluish-green. The Colorado blue spruce (*Picea pungens glauca*) is a naturally occurring variety with needles of a definite blue. Wyoming to Utah, Colorado and New Mexico.

Low-Growing Varieties

'Compacta'. Dense, blunt-topped, rounded mound with horizontally spreading branches and crowded short branchlets. Leaves green, short, up to ¾ inch. At 75 years, 11 feet high, 12½ feet wide.

***glauca* 'Globosa'.** Spreading, somewhat irregular mound of intense gray-blue color. Branches stiff and rather stout, ascending and spreading. Branchlets fine, crowded, variable in size. At 10 years, 18 inches high, 3 feet wide.

***glauca* 'Prostrata'.** A ground-hugging variety of the Colorado blue spruce. The stout stiff branches are almost completely prostrate, but with some ascending slightly. Branchlets short, not crowded. Leaves mostly long and stout, glaucous gray-blue. At an estimated 75 years, 2 feet high, 8 feet wide.

***glauca* 'R. H. Montgomery'.** Compact, broadly conical form. Branches and branchlets crowded, leaves long and stiff, grayish-blue.

YEW

Botanical name of genus: ***Taxus***
Pronunciation: *tax*-us

As evergreen shrubs and small trees, the yews have long been looked upon with favor for planting around homes. The two species most frequently seen in cultivation—the English yew (*Taxus baccata*) and the Japanese (*T. cuspidata*)—have been grown since ancient times in their native lands.

Characteristics of the Genus

Description. The needles of yew are mostly of a rich dark green and about an inch long. They are arranged in two ranks. Single seeds are carried in fleshy red cups which stud the plants like scarlet berries in the fall. The development of many distinctive varieties from seed or as bud mutations gives them, as a group, special horticultural value. Diversity in color as well as in size and shape is characteristic of the dwarf yews.

The Species

***Taxus baccata,* English Yew.** Slow-growing, densely-branched tree to 40 or more feet. Leaves lustrous and dark green with a very short greenish stalk. Europe, northern Africa and western Asia.

Young plant of English yew 'Amersfoort', showing foliage detail

Japanese yew branchlet

Low-Growing Varieties

Compact Plants

(Pyramids, globes, mounds)

'Amersfoort'. Distinctive compact pyramid with stiff, semi-erect branches. Leaves small, oval, and thick, spreading radially on the short, widely-spaced branchlets. At 10 years, 15 inches high, 10 inches wide.

'Argentea Minor'. Slightly spreading, somewhat flat-topped mound. Leaves small, dark green, edged yellow in early spring, later with narrow silvery margins. At 20 years, 18 inches high, 24 inches wide. Annual growth to 1 inch.

'Compacta'. Ovoid little bush with densely crowded ascending branches and branchlets. Leaves small and fine, mostly radially spreading, dark green and glossy on older twigs. Current growth somewhat reddish-brown in winter. At 15 years, 15 inches high, 7 inches wide. Annual growth less than 1 inch.

'Nana'. Low, open mound with irregularly ascending branches. Branchlets erect. Leaves somewhat variable, mostly short,

English yew 'Standishii', 3½ feet tall, 25-year-old plant

rather broad and thick, crowded. At 25 years, 18 inches high, 36 inches wide.

'Pumila Aurea'. Bun-shaped plant with bright golden leaves in summer. These become bronze-gold in winter and green the second year. At 25 years, about 4 feet high and slightly wider.

Fastigiate Plants

(Branches rising vertically close to main stem)

'Columnaris'. Narrow, compact column of erect, crowded branches. Leaves pale gold in early spring, developing later a wide green midrib and becoming all green by the end of the season. At 25 years, 6 feet high, 18 inches wide.

'Standishii'. Rather broad column with erect crowded branches. Leaves brilliant gold in spring, greenish in late summer, turning yellow again in fall, becoming glossy black-green the second year.

Spreading and Prostrate Plants

'Adpressa'. Dense shrub with ascending and spreading branches. The distinctive little needles, in two ranks, are relatively broad, under ½ inch long, and rounded at the apex except for a minute point.

'Horizontalis'. Main branches at first upright then spreading horizontally. Branchlet tips not pendulous. Large curved leaves, erect in a V-shaped arrangement, tend to roll back toward the base of the shoot. At 30 years, 2½ feet high, 7 feet wide.

'Repandens'. Wide-spreading plant with long horizontal branches and pendulous branchlets. Leaves dark green, varying in length, often curved and forming a V-shape on the branchlets. At 75 years, about 11 feet high and 37 feet wide.

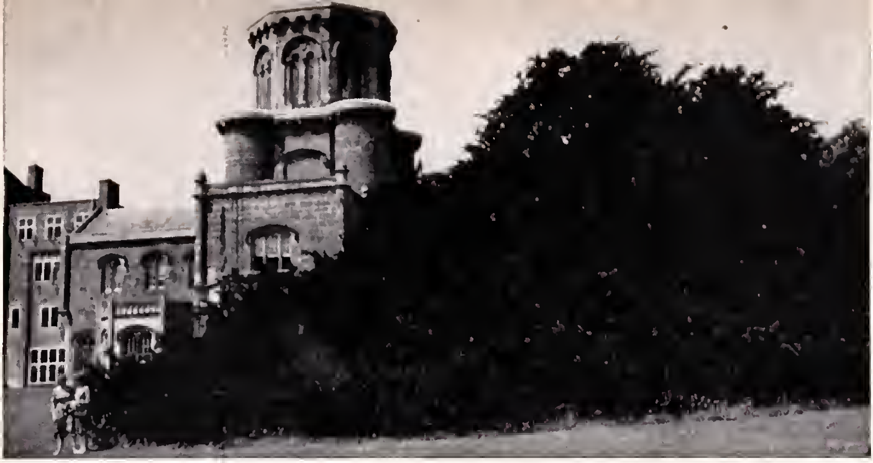
The Species

***Taxus cuspidata,* Japanese Yew.** Tree with wide spreading or ascending branches, to 50 feet. Leaves dull dark green with a short yellowish stalk. Japan, Korea and Manchuria.

Low-Growing Varieties

'Aurescens'. Low, spreading, open-centered shrub; main branches ascending, branchlets and leaves short, mostly erect.

Japanese yew 'Aurescens', measuring less than 2 feet in breadth in 20 years



Avery

This majestic "dwarf" specimen of weeping English yew (*Taxus baccata* 'Dovastoni') was planted at Studley Castle about 1830. In 1964 it was 28 feet high and 300 feet in circumference. The castle and estate are now the site of Studley Agricultural College, Warwickshire, England.

Leaves bright gold in spring and summer, becoming greenish at the base of the shoots in fall and entirely green the second year. At 20 years, 13 inches high, 23 inches wide.

'Densa'. Wide-spreading mound with crowded, ascending branches and short erect branchlets. Leaves short, mostly erect, standing in V-shape. At 65 years, 6 feet high, 22 feet wide (Arnold Arboretum).

'Hiti'. Symmetrical narrow column of crowded erect branches and branchlets. Leaves green, appressed on the inner sides of the branchlets, spreading on the outer sides. At 15 years, 4 feet high, 10 inches wide. Broadens with maturity.

'Nana'. Low and spreading, somewhat flat-topped when young, with crowded, horizontal branches and numerous short branchlets. Leaves short, rather broad, upright, dull dark green. At 35 years, 5½ feet high, 16 feet wide.

'Thayerae'. Spreading, somewhat flattened shrub with horizontal branches and ascending, arching branchlets. Leaves bright green, 2-ranked. Fruits freely. At 41 years, 12 feet high, 35 feet wide (Arnold Arboretum).

TIPS ON CHOOSING PROPAGATION MATERIAL

WHEN propagating dwarfs, as a general rule, strongly growing terminal shoots should be avoided for taking cuttings (or scions for grafting). Continued propagation from such shoots, through many generations, seems to result in loss of desirable compactness or slowness of growth. Also, to help maintain the character of a dwarf variety, propagating material should always be selected from those branches that best represent the general form of the plant. In spreading, low-growing plants for example, cuttings and scions should be taken from low side branchlets rather than those nearer the apex of the plant. Conversely, upright symmetrical dwarfs are best propagated from nonvigorous apical shoots.

Grafting is usually resorted to when other propagating methods are not particularly successful. When grafting, it is desirable to use slow-growing understocks. These are more satisfactory for choice varieties than the strong-growing specimens generally used for such purposes. While it is commonly understood that understock and scion should be of the same or closely related species, it should be pointed out that grafting uncongenial species has often been successful, and generally results in slower growth of the scion—thus aiding in the dwarfing process. Such grafting, however, is best left to those willing to experiment over a considerable period of years, because of possibly adverse effects not immediately apparent.

PLANTING AND CARE OF DWARF CONIFERS

THE numerous tones of green as well as other colors, and the often picturesque shapes of dwarf conifers, offer unusual opportunities in landscape planting. These relatively small plants are long-lived and easy to maintain, provided their simple cultural needs are understood and translated into appropriate care.

Planting and Feeding

Most dwarf conifers are purchased in containers. This gives them the solid ball of soil that is needed around their roots. If the roots of a newly acquired plant happen to be bare (though this is unlikely), they should not be allowed to dry out for a moment, nor should they be exposed even briefly to the sun.

One reason for this is that most, perhaps all, conifers live in partnership with a fungus (mycorhiza) which surrounds their roots and assists the plants in obtaining nutrients from the soil. This root-fungus is more sensitive to dryness and sunlight than the roots themselves.

Conifers as a whole are plants of low fertility requirements, and the dwarf varieties are even more amenable to scanty fare. In fact, if heavily fertilized, many will respond by putting on greater than normal growth. The most effective source of nutrients for them is well-decomposed organic matter, such as rotted manure, leafmold or compost.

Soil

For the majority of dwarf conifers, the ideal soil is a well-drained sandy loam on the acid side (that is, below pH 7 on the scale for measuring acidity and alkalinity). If only heavy clay soil, acid in reaction, is available, it can be made more suitable for planting by adding an equal quantity of a sand-and-peatmoss mixture. An alkaline clay soil would impose undue hardship on most coniferous species, but some of the dwarfs have been known to persist in such a soil with no apparent adverse effect. Full-size conifers that will grow satisfactorily in limy (alkaline) soil include *Chamaecyparis lawsoniana, Juniperus communis, J. chinensis* and *J. sabina, Pinus strobus* and *P. sylvestris,* the common arborvitae (*Thuja occidentalis*), all varieties of the English yew (*Taxus baccata*) and species of *Cedrus.* Cryptomeria and arborvitae will thrive in stiff clay. Arborvitae will also grow in somewhat marshy ground, as will hemlock (*Tsuga canadensis*), white-cedar (*Chamaecyparis thyoides*) and balsam fir (*Abies balsamea*); but these also do well in drier soils. In general, they are very tolerant of a wide range of soils.

Watering

Although dwarf conifers are fairly tolerant of dry conditions, they should not be allowed to suffer during a long rainless period. Newly set plants should be watered regularly, at least until well established. This means not a daily sprinkling but a good soaking every week or two when rainfall is lacking. Watering should be resumed in autumn, for it can be disastrous for evergreen conifers not yet established to go into the winter with a dry root system.

Mulching

Many materials can be used, depending in part on what is most readily available. Among suitable mulches are pine needles and buckwheat hulls. Least suitable is granulated peatmoss, which either dries up and blows away or actually prevents rain or hose water from penetrating the soil. Partially decomposed leafmold or compost makes a good year-round mulch. For large areas where work-free maintenance is essential, a mulch of pebbles or crushed stone has been found very satisfactory.

Exposure and Hardiness

How much exposure a dwarf conifer can take in the garden depends to a great extent upon the hardiness of the species. Dwarf varieties of such ironclads as the common Norway spruce (*Picea* *abies*) succeed almost anywhere. Varieties of more tender species must be placed with greater care. Pockets where the winter sun warms the air to an extreme degree during the day are to be avoided because the plants are likely to be stimulated into premature spring growth. The varieties of tender species benefit from prolonged dormancy and do best in a spot protected from wind, even in a colder part of the garden, as long as there is little daily fluctuation of temperature. For species and varieties of doubtful hardiness, a planting site should combine winter shade, well-drained soil and protection from drying winds.

For planting in seaside locations, according to E. E. Kemp* of the Royal Botanic Garden, Edinburgh, varieties of *Cryptomeria japonica* will tolerate salt-laden winds as well as any. *Juniperus chinensis* and *J. virginiana*, he says, are also fairly resistant to salt spray. Among the spruces, the Colorado (*Picea pungens*) is best. The Scots pine (*Pinus sylvestris*) is reasonably satisfactory close to the sea. The most tolerant arborvitae is *Thuja occidentalis* of eastern North America. A. D. Webster in *Hardy Coniferous Trees* mentions also the oriental arborvitae (*T. orientalis*) and *Chamaecyparis nootkatensis*, among others. Salt-spray tolerance of red-cedar (*Juniperus virginiana*) is borne out by the plant's frequent occurrence in seaside pastures in New England.

Sun and Variegation

The colors of conifers, when they are other than green, often vary according to the season, the temperature or the amount of intense light they receive. Adequate sunlight is necessary for most color forms. The gradual disappearance of a brightly variegated plant, or a transition to dingy, drab coloration, can usually be traced to the shade from increasingly larger neighboring trees. The pattern works also in reverse: Variegated plants that have lost their variegation can generally be restored to color if provided with more abundant sunlight.

Pruning

When a low-growing conifer is approaching the maximum size desired, as in a foundation planting, it is easy to control its naturally restrained growth by selective pruning. Otherwise, pruning is not usually thought of in connection with dwarf conifers, though with some kinds it can be a useful practice. Pruning is distinct from shearing, which is sometimes done with plumose types of *Chamaecyparis*.

To reveal the architectural magnificence of older dwarfs of such choice varieties as the Sargent weeping hemlock, selective pruning can be effectively done. The larger branches or multiple trunks can thus be made visible through subtle gaps in the foliage.

The sanitary practice of cleaning out the underlying twigs and branches that have died as a result of being heavily shaded by the dense outer foliage is another kind of pruning. This is rarely more than a hand operation because the brittle twigs snap off easily. If larger branches are removed to effect change in shape or reduction in size, they should be cut with a saw and the wound painted, as with larger trees.

Pest Control

Dwarf conifers are subject to relatively few pests and diseases. The most common trouble is an attack of spider mites (so-called "red spider"), which occurs most frequently on dwarf varieties of spruce and hemlock that bear tightly packed needles. These spider-like animals can be seen only with a magnifying glass. Their symptoms, yellowing and dropping of the needles, are more evident. Such an attack is most likely to occur in dry weather. Hosing the foliage forcefully every week will generally keep the plants pest free, but if the trouble persists, flowers of sulfur can be used as a dust, or a miticide such as malathion or dimite can be applied as a spray. Prompt treatment will curtail disfiguration of the foliage and may save the entire plant.

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*Writing in *Dwarf Conifers* by H. G. Hillier, published jointly by the Alpine Garden Society, 58 Denison House, Vauxhall Bridge Road, London, S.W. 1, England, and the Scottish Rock Garden Club, 37 Kirkhill Road, Penicuik, Midlothian, Scotland, 1964. 10/6.

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Cranford Memorial Rose Garden at the Brooklyn Botanic Garden

THE BROOKLYN INSTITUTE OF ARTS AND SCIENCES
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Summer 1965

The garden rose is probably the best known and most universally loved of all the flowers on earth, and while not everyone can grow a perfect rose, perfect roses appeal to everyone.

In his "The History of the Rose" Roy Shepherd has traced their story from ancient times, and here in capsule form are his observations: If fossil specimens-in-the-rocks have been properly identified, and there is every reason to believe they have—roses have dwelt in the northern hemisphere for some 30 million years. They live in a vast geographic area that extends from above the Arctic Circle into Mexico, North Africa and India. The more than 200 species known to grow in the wild have undoubtedly evolved through natural hybridization—but fewer than 10 of these wildings are thought to be the parents of most of our garden hybrids. According to Shepherd these ancestral forms are native to Asia, because it is only the wild species of that continent that are freely recurrent in bloom, bear yellow flowers, and have climbing or trailing growth habit.

Roses were almost surely cultivated by the ancient civilizations of China, Western Asia and North Africa—5,000 or more years ago. And we know that roses were popular in the Roman Empire throughout its several-century existence. The first accurate account of roses cultivated in Europe was given by de Lobel in 1581, and Asian species began to find their way to the western world about 1700. The first illustrated book devoted exclusively to the rose was published in 1799. The 172 historic Redouté plates, with botanical descriptions by Thory, were issued in three volumes between 1817 and 1824.

The French nurseryman, Desportes, offered the impressive number of 2,562 different varieties in his catalog for the year 1829. In the last 100 years rose breeding has gone on at an almost feverish pace, and it is commonly said that there are more than 5,000 varieties in the trade today. Since the Plant Patent Act was passed in 1930, more than a thousand varieties have been registered in the U.S.A. The rose industry has become a multi-million dollar business.

A word to rose-minded travelers going to France: Visit the Bagatelle on the outskirts of Paris. It was the first rose test garden ever established (La Roseraie de Bagatelle, 1907).

When our Editorial Committee invited Sidney B. Hutton, Sr. to edit the Handbook on Roses, he responded with enthusiasm and invited skilled rose breeders and growers of two continents to share the responsibility with him. All of us at the Botanic Garden are proud of their achievement. The Handbook will long be a worthy quick-reference medium on the rosarian's shelf, and will stir interest and provide know-how for many who have yet to grow their first rose.

A few botanical thoughts should be included here, lest readers overlook the impressive fact that the genus ROSA is but one group in a big and magnificent plant family (ROSACEAE). Other blossom-happy groups in this family are flowering crab apples, peaches, Japanese cherries, shadbush, spirea, hawthorn, flowering quince and almond—and many others. Without the Rose Family, there would be no luscious apples, juicy peaches, golden pears or nectarines, tart plums or cherries. Life would be considerably less pleasant without the Rose Family. Its members are an important plant link in human culture—important to the mind, the heart and the palate.

Sincerely yours,

George S. Avery, Jr.

Director

Roche

WHY GROW ROSES?

Sidney B. Hutton, Sr.

WITHOUT any doubt, the rose is the most widely grown of any ornamental plant. There are many reasons for its popularity. Roses bloom from spring through the summer until frost. They come in a great range of colors and in many forms and sizes of flower; some with only five petals, others with 100 or more. They vary from the tiny Miniature roses less than an inch across to huge blooms like 'Peace', more than 6 inches in diameter. Many are delightfully fragrant. Roses, I think most people will agree, are probably the most beautiful flowers that can be grown by the average home gardener.

There is as much variation in character of plant growth as there is in bloom. Thus, among roses, varieties exist for almost any location and taste. The Hybrid Teas and Floribundas, which bloom throughout the summer, are excellent for beds, borders and hedges. Climbing roses have many uses. Shrub roses and old-fashioned roses are excellent for specimen plants, backgrounds and planting in with evergreens and other plants. There is scarcely a landscape need for which some suitable type of rose cannot be found.

So favored are roses that the societies devoted to their study and culture include more people than groups devoted to any other one plant. The American Rose Society now has 17,000 members, many of whom are organized into over 200 local groups which meet periodically to discuss roses, their uses and care. The National Rose Society of England has over 100,000 members. Many of these groups put on rose shows for the display of their most prized blooms in competitions.

Contrary to a common belief, roses are easy to grow and will thrive in almost any soil and location except deep shade. They will produce more flowers over a longer blooming season than any other type of plant except a few of the lush-growing annuals. Like every other garden plant, they respond favorably to extra care in soil preparation, to spraying for the prevention of disease and insect damage, to fertilizer and to liberal watering during extended dry weather.

Extra flowers on vigorous plants will be the reward of good care. But there are few if any hard and fast rules. While some authors in this Handbook may describe practices they have found successful and prefer to use in their own gardens, other growers may obtain equally good results with different methods.

Rose-growing can be a gratifying pastime. I hope that the articles that follow will encourage many more to share the pleasure. ✦

Rose Arc of the Cranford Memorial Garden, Brooklyn Botanic Garden

Gottscho-Schleisner

ROSES IN THE HOME LANDSCAPE

Roberta Lord

THOUGH roses are long-lived woody plants, they attain a full-scale size and aspect their first summer after planting. This is magical help for the raw, wholly new garden and no less useful in remodeling, where they promptly blend in with older plants of all kinds. Where home owners wish to develop a plan over a period of years, some roses can be put in place for quick effect and for cutting. Later, beds can be extended or added at the rate desired without fear of uneven appearance in the results.

Another advantage of roses is in the abundance of repeat-blooming kinds and the quantities of flowers that modern varieties can produce. Good soil, ample water and prompt cutting of blooms as they develop will keep new shoots and flowers coming on every plant. Different varieties have different speeds of fading and rebloom, so with an assorted planting of roses it is remarkably easy, even in a small garden, to have constant and continuous bloom.

They have other assets. When planted, all the usual types of garden roses stay where they are put; proportions and pattern of beds and adjoining areas can easily be maintained exactly as planned. Grass, also seedlings of other plants, will try to invade the rose bed, but roses

Gottscho-Schleisner

A cultivated climbing rose allowed to sprawl naturally over a rocky outcrop on a country property brings a sense of intimacy to the distant view.

never retaliate by invading others areas.

Best of all, perhaps, is the infinite adaptability of roses to style and function in the home landscape. We can have a dooryard garden that will outdo in charm and bloom the rose-bowered cottage of old; or we can have a formal rose garden that is as stately and grand as we wish. Identical varieties planted in adjoining gardens can take on quite different aspects. Much depends on their placing, spacing and, above all, the gardener's habits of cultivation, including pruning and cutting of blooms. I have seen roses espaliered. In Longwood Gardens, a variety that is capable of covering six feet of wall is kept restrained and trained to make delicate, slender arches over a series of steps.

Altogether, acquiring roses to set out

is somewhat like possessing Aladdin's lamp: in garden terms, the desired effect is achieved with magical speed.

Roses as Hedges and Flower Borders

Bushy, densely foliaged varieties of roses make good unsheared hedges. Floribundas are often used — many varieties are suitable and their clusters of blooms are showy. I have seen fine hedges of other types, including Hybrid Teas. In fact, the most impressive tall barrier hedge I ever saw was made with a variety of Hybrid Tea that the owners wanted to have for cutting in quantity — a good point to consider when planting a hedge.

A border of assorted roses can combine unity with great variety in color, size and form of both bloom and inflorescence, also in size and type of plant, from miniatures to shrubs to climbers. Some bloom one and some a few flowers to a main stem (many plants do both); some come in dainty sprays of bloom, some in massive clusters, others send up spirelike floral candelabras. In foliage, too, there is variety in size and color, as well as glossiness, not only between plants but between new leaves and old. A rose border design can aim for harmony or diversity, for rhythmic variation or gradation in color, type and size of plants. Planting plans can be developed with color pictures cut from catalogs and marked for plant types and sizes.

Without roses, continuous bloom in a flower border demands much replanting, or else space for many groups of many kinds of plants. This is an increasingly important factor in areas where hot sun speeds the bloom-and-go-to-seed cycle of bulbs and perennials. That same heat

From inside the house, this little rose planting below a window has the visual effect of bringing roses right into the living room. From the outside, it relieves the severe straight lines of the house and window sill.

Taloumis

speeds weed production, but it also warms the soil, so roses can, and should, be kept well mulched there. Weeding, then, is much less of a problem than with a mixed border of herbaceous perennials or annuals.

A rose border may be of any desired length, and may be curved or straight. The width must depend on three things: how it will look in the given location; size and type of plants to be used; the needs of the gardener for speed, ease and comfort in working around the plants or cutting blooms. A single row of plants with space on both sides can look skimpy. Two staggered rows in that location give better mass and are easy to maintain. A third row of low plants or miniatures would be manageable. For greater width, it is usually better to make separate beds with a path between.

Roses as Screens and Barriers

A border of roses planted chiefly for the pleasure its flowers give can also define a garden area or it can serve as a barrier or screen. Where other types of barriers might be resented by neighbors, I have never heard of anyone objecting to a bed of roses between properties, if there is space to work around them without infringing.

For a tall screen, use Grandiflora roses and tall Hybrid Teas that are pruned high, either alone or faced down with lower-growing types. Still greater height can be obtained by adding climbing roses. Their support can be quite skeletal in nature, such as a simple series of arches or posts, separate or connected, or each one furnished with horizontal dowels or lattice strips. Climbing rose stems are woody and fairly strong in age; supports serve to train them to the desired position and keep them from sprawling in unwanted directions. The stems can be tied up around posts to a desired height and then allowed to spray out in a weeping tree form, or pruned to make thick, rounded heads above the posts.

Sometimes a tactful and pleasant tall screen is needed in a rather narrow area between two houses. Here, if the place is not too shaded, a narrow rose border, or a rose-covered arbor or pergola, can sometimes be an attractive solution. If a driveway is there, the pergola idea can be developed to give the effect of a rose-covered porte-cochère.

Armstrong Nurseries

This small formal garden shows what can be done with crushed stone instead of a lawn, square planting areas edged with wood for the roses, and a background fence with horizontal boards designed to permit air circulation between them.

A screen planting in a crowded neighborhood can also keep outdoor living areas out of sight of one another, even when fairly close. Roses can thus screen out a street, a drive, a play area or the neighbor's garbage cans. A border of roses can form a fence, as well as a screen. Bare fences always challenge youngsters to climb them; rose plants do not.

A tall rose border that may be acting as a screen from objects outside the garden becomes, in turn, a background for the garden side, whether it be a sweep of lawn, a patio, more beds for roses to make a real rose garden, or other shrubs and flowers. Even if full development of the area is to come later, the pattern of the rose border and the adjacent area should be planned together to make attractive views from the house as well as from within the garden.

(*Concluded on page* 28)

THE WHERE, WHEN AND HOW OF PLANTING ROSES

C. H. Lewis

Where to Plant Roses

MOST roses do best and are more easily cared for if they are planted in beds to themselves. Large shrub roses may be used as individual plants, but if other types of roses are desired among other plants, they look best if placed in groups of three or more.

Roses require a well-drained, sunny location that is not too close to hedges, trees or buildings. There should be free circulation of air but some protection from strong winds.

Good drainage means that surface water disappears quickly after a rain or during a winter or spring thaw. This is essentially because roses will not tolerate "wet feet"—that is, water standing on the soil around their roots.

Sun is needed for six or eight hours a day, but light shade in the afternoon is beneficial in holding color during the hot summer months.

When to Plant

There are two seasons when roses can be satisfactorily planted: fall and spring. Dormant bare-root roses from a local nurseryman or from a mail-order nursery may be set out either in late fall, after heavy frost has stopped all growth, or very early in spring. Packaged roses from garden centers and stores, usually available only in spring, are also best set out as early as possible, though planting of both kinds can be done until warm weather arrives, which is about the time that tulips and lilacs bloom.

In the far north where winter temperatures of 10 degrees below zero can be ex-

Floribunda roses provide a wealth of summer bloom beside this brick path.

Grossman

Jackson & Perkins

Armstrong Nurseries

Bare-root roses, carefully packaged, are ready for planting as soon as received in spring.

pected, spring planting is likely to be most successful. It is also better in the south where roses lack the benefits of winter dormancy.

Fall planting is preferred by many experienced rose gardeners through the middle states where the lowest winter temperature is normally 10 degrees above zero to 10 degrees below. The only special precaution when planting in the fall is to take clean soil and mound it well around the tops of the newly planted roses. This protects them from sun and wind the first winter. The soil mounds should not be leveled down until growth starts in the spring.

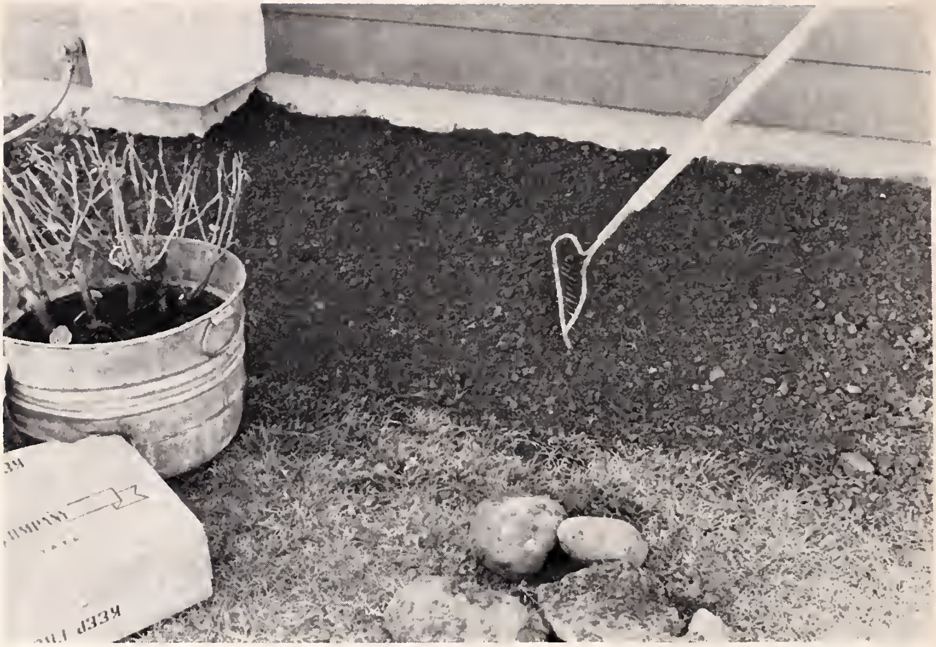
After the arrival of warm weather, it is better to use potted roses instead of bare-root or packaged ones. These are offered in large paper containers or metal cans at many nurseries and stores, and they will have started to grow. They can be planted at any time during the summer, but they will bloom better the first season if they are planted in May than if delayed until June or July. For gardeners who may find a vacant spot or decide late in the season to have more roses, potted plants are a special convenience.

How to Buy Plants

Like other products, rose plants vary greatly in quality, and price is likely to give some indication of their worth. Cheap plants are rarely a bargain. Since roses can ordinarily be expected to grow and bloom for many years, it is advisable to secure the best plants available. The specialist who features roses year after year, whether it be a mail-order house, a local nursery or garden center, or a store selling plants, is likely to be the best source of supply.

Selecting the Varieties

There is such wide variety in roses that it is helpful, a season ahead of planting, to make a selection from roses blooming in the gardens of friends or in other private or public gardens or at nearby flower shows. A type of rose exists for almost



Jackson & Perkins

Although close to the house, this rose bed receives almost full sun. The soil has been deeply prepared and drainage assured. Bare-root roses should be soaked, as shown, for an hour or more before being set in holes.

every landscape plan or garden situation. Many are suitable for bedding, others for hedges or fencing, and numerous kinds for trailing or climbing, covering the ground or a pergola. For beginners, the proven varieties are usually best.

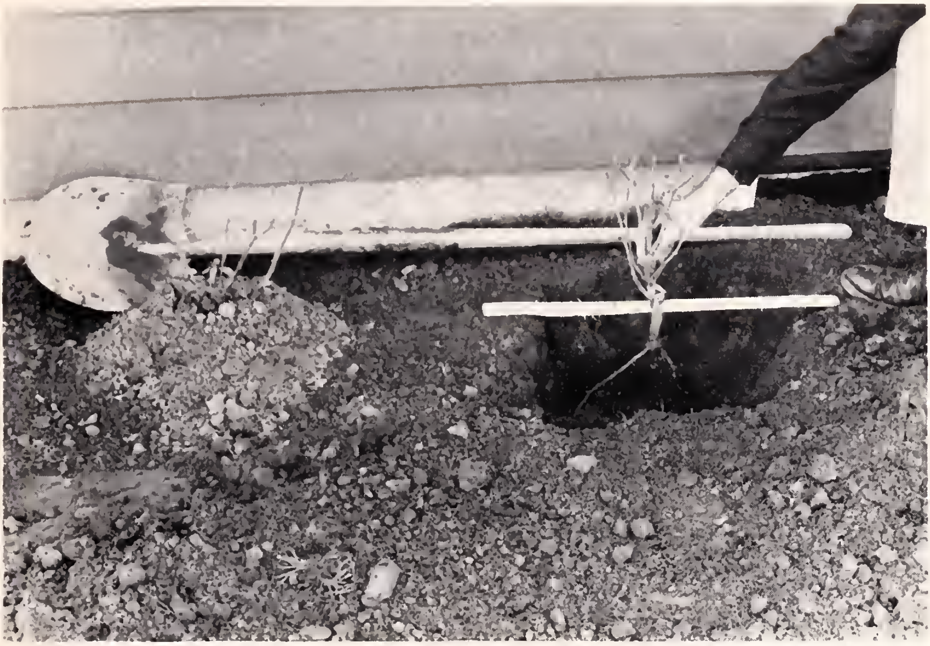
Preparing the Bed

Roses will grow in almost any good garden soil, but for best results over the years the soil should be carefully prepared. The more care given to good preparation, the greater the reward that will be reaped in vigorous growth and abundant bloom. If the soil is poor, it goes without saying that it should be improved before roses are set out.

For fall planting, the ground should be made ready several weeks in advance, to allow the soil to become well settled. For spring planting, if at all possible, it is advisable to prepare the ground the previous fall. An abundance of organic material, even up to a third of the total soil mixture, will be needed to assure good soil aeration and moisture-holding capacity. This can be peatmoss, probably the most easily available, or it can be decayed leaf mold, material from the compost heap, or well-rotted barnyard manure if you are so fortunate as to have it.

Because rose roots grow deep, the beds should be prepared to at least the depth of two spades. A recommended method is to remove the topsoil to a depth of one spade and lay it aside, then add peatmoss or other organic material and spade it into the subsoil as deeply as possible, mixing it thoroughly. A good garden fertilizer can be mixed with this subsoil in the bottom of the bed at the rate of 4 pounds to 100 square feet. Then the topsoil can be returned, mixing with it more peatmoss or other organic material. Do not use fertilizer in the top of the bed. The holes to receive the roses are not dug until after the soil has settled, just before planting.

If one lives in a new development where the topsoil has been removed and the surface soil is the original subsoil, thorough



Jackson & Perkins

A stick laid across the hole makes it easy to set the bud union at the proper level—at, or somewhat below soil surface. Note mound of soil on planted bush at left.

preparation of the rose bed is essential. Here the organic material is especially valuable, both in conditioning heavy clay soil and in helping sandy soil to hold moisture for the roots.

While roses are tolerant of a wide range of acid and alkaline soils, they do best in a slightly acid situation. This condition can be provided by peatmoss. The use of lime to modify acidity is necessary only when extremely acid conditions are found.

If you have had difficulty in growing other plants or if for any reason you suspect that the soil may need some special treatment, it is possible in most localities to have it tested at small cost. Get in touch with your County Agricultural Agent at the County Seat, or send a sample to your State Agricultural Station.

Planting

When an order of roses arrives, the plants should be promptly inspected, and if all conditions are suitable, they should be planted with minimum delay. But if they appear to be dry when received, each plant, the entire top and roots, should be soaked in water overnight or up to 24 hours, but not longer. Whatever their condition, it is advisable to soak the roots for at least an hour before planting, and to keep the roots of each rose in water until time to set it in its own hole.

I think it a good practice to trim about one-fourth inch from the tip of each root before planting to give new growth a rapid start. Also before planting, broken or otherwise damaged roots or canes should be cut off with sharp clippers.

Ordinarily, rose plants come from the nursery ready for planting, with the tops trimmed to about 10 inches long. If the tops are longer, it is well to cut them back to that length or even make them shorter.

Except in very severe climates, roses should be planted with the bud union (where the top joins the root) at or just below the ground surface. In more northerly regions it is advisable to have the bud union covered with about 2 inches of soil. A board or stick laid across the planting hole is a useful guide in determining the depth.

Do not set an expensive rose plant in a 25-cent hole, or expect a substandard plant to produce in a $3 hole. Dig each hole of sufficient size and depth to accommodate the roots in their normal, natural growing position. Place topsoil that does not contain fertilizer, either natural or chemical, around the roots, filling all the spaces between the roots and packing it firmly with a blunt tamping stick or by tramping the soil with your feet. After the hole is nearly full and well tamped, apply an abundance of water and allow it to drain away. Then fill the hole with loose soil.

When planting dormant roses in either late fall or early spring, mound more loose soil around the stems to a height of 8 inches or more and leave it in place until the rose starts to grow. If the rose is planted in the fall, this protects the stems from being damaged by winter frosts; in the spring, the mound of soil guards the canes against drying by sun or wind. If dieback is revealed at the tops of old stems after growth starts, the stem should be pruned back to live wood, whatever the season.

Spacing

In the middle and northern states, Hybrid Tea and Floribunda roses are ordinarily spaced about 2 feet apart, but farther south 2½ to 3 feet is better because of the greater amount of growth obtained during the longer season.

When filling a vacancy in a rose bed, remove the soil in which the previous rose had been growing and fill the hole with fresh soil from another part of the garden where there have been no roses. This will prevent the carry-over of soil-borne diseases and pests.

If these detailed instructions sound like excessive work, remember that a rose bed is prepared for many years of enjoyment. When the blooms begin to come the chores are soon forgotten. ✦

KNOWING ONE'S ROSES BY NAME

IT adds greatly to the interest of a rose garden to have each variety identified by name. Each plant that comes from a nursery has a label fastened to it with wire. This should be kept, but unless it is removed when the rose is planted, the cane to which the tag is attached may be damaged by the wire as it grows. This same label may be attached to a stiff wire or other convenient stake and placed near the rosebush; or other suitable labels can be made or purchased. Appropriate plant markers are available in many styles, and some of them are inexpensive.

Because plant markers do sometimes get lost, even in the best kept of gardens, it is desirable to keep a written record of the names and locations of the roses you are growing. A sketch showing the plan of each bed is convenient to have in your notes. Pertinent details regarding the variety, sources of plants and other information become of value in future rose-growing years.

CARING FOR BUSH ROSES

Peter Malins

SUCCESSFUL culture of bush roses is neither difficult nor time consuming. Attend to their simple needs regularly and you will be rewarded with healthy plants and generous bloom.

Pruning

Bush or shrub roses need a certain amount of pruning, though not as much as Hybrid Teas and others. The best time to do it is in early spring, while the plants are still dormant. Cut out dead canes and those that are diseased. Also do any shaping that seems desirable.

Fertilizing

After plants have become established (that is, three or four weeks after planting) they should be given fertilizer regularly. It is best to use small amounts at a time, feeding the plants three times during the growing season.

As an inorganic fertilizer, I use 7-8-5 or 5-10-5, and apply it at the rate of about 4 pounds per 100 square feet of bed a year, or three applications of 1⅓ pounds each during the season. This is equivalent to using one to two tablespoonfuls per plant each time.

Spread the fertilizer evenly over the surface of the ground within a circle 6 to 8 inches from the plant. Cultivate it in and then water the plant thoroughly. Do not apply an inorganic fertilizer when the foliage is wet. It is difficult to keep from spilling it on the leaves and when it adheres to them burning may result. In the New York area the first rose feeding is given during April, just as the buds begin to break. A second application is made the last week in June and a third in the middle of August. Roses should never be fertilized later than this. In areas which have frost in the first two weeks of October, even this last application of inorganic fertilizer should be omitted. It is apt to induce late growth, and the succulent new canes are susceptible to killing by frost.

In addition to commercial fertilizers, an application of well-rotted cow manure is highly desirable every two or three years. It should be applied in the fall and dug in around the plants in the spring.

If an organic fertilizer is to be the only kind used, select either bone meal or dehydrated cow manure. Such fertilizers are mild and will not burn the plants. Rose plants respond to bone meal very slowly, so it should be applied either early in spring or late in the fall. If put on in the fall, it does not affect growth until the following spring. For good-sized plants, use two to three handfuls and scratch it into the soil rather deeply around the plants.

Mulching

For good rose culture, mulches are desirable the year around. After the first feeding and after the beds have been carefully cleared of over-wintering weeds is the best time to apply a mulch. This should be early enough in spring to prevent new weed growth.

Among successful mulches which we have used are buckwheat hulls, cocoa bean hulls mixed about half-and-half with sawdust, and wood chips. I cannot recommend either peatmoss or cocoa bean hulls alone for this purpose, because they tend to cake and to shed rain water that the roots badly need. They also reduce the air supply to the root system.

Five advantages of using a mulch are:

To help retain soil moisture

To prevent, or at least reduce, the growth of weeds

To keep soil relatively cool during summer and thus encourage root growth

To give the beds a neat and tailored look

To help keep soil temperatures even in winter.

A mulch 3 to 4 inches deep is needed in cold weather. Thus after the soil freezes it remains frozen, and there is little or no danger of plants' heaving because of alternate freezing and thawing.

Most mulches, as they begin to decompose, tend to rob the soil of nitrogen. To prevent nitrogen deficiency it is necessary to supply extra fertilizer. Whenever new mulching material is applied, therefore, add about 3 pounds of ammonium sulfate per 100 square feet of mulched bed. This is over and above the regular fertilizer requirement, and may be placed on top of the mulch; soluble fertilizers such as ammonium sulfate work down into the soil readily. If soil tests show readings below pH 6, enough lime should be added to raise the soil to pH 6.0 or 6.5.

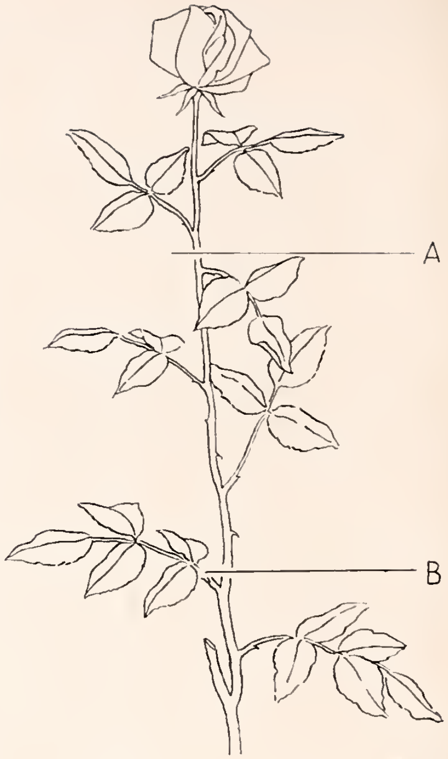
Mulching greatly reduces the work of weeding and gives the garden an attractive appearance. If rose beds are not mulched, it is necessary to cultivate the soil often enough to keep it loose and to destroy weeds.

Controlling Pests

For best results in controlling pests, the spraying of rose bushes should begin early in the spring as the first leaves develop. Apply rose spray or dust every 10 to 14 days, and continue applications through the entire summer. For maximum effectiveness, spraying and dusting should precede rain.

Melady

A special nozzle attached to a garden hose will moisten the ground without getting water on leaves.



Melady

When cutting roses in summer, cut at "A." From just above the base of the remaining leaves, new flower-producing branches will develop. In autumn, cut at "B" because there will be no time for additional flower-producing branches to develop.

Irrigation, Watering

Roses should not lack for water, but a light surface sprinkling is worse than no water at all. When the weather is dry, water rose plants thoroughly at least once every 10 days. Avoid wetting the foliage. Moisture on the leaves, especially over night, encourages the spread of fungus diseases. If a rose bed is small, it can be watered with a regular garden hose and "Water-rite" nozzle. This is a metal pipe, 3 feet or more long, with a "water-break-

(*Concluded on page* 20)

PRUNING OF ROSES

Robert M. Zollinger

ADHERENCE to a few basic principles of pruning will pay rich dividends in the growing of Hybrid Tea, Grandiflora, or Floribunda rose bushes. Very few shrubs require the removal of as much wood by pruning every year as the rose bush. Sharp and well lubricated pruning instruments of high quality lessen injury to the plants; tough leather gloves avoid injury to the pruner.

I do not recommend autumn pruning, in general. In the region of Ohio there is less winter kill if the canes are left long until spring pruning. Furthermore, valuable live wood may be unnecessarily sacrificed if heavy pruning is carried out in the fall. Rather than prune, it is preferable to tie the long canes together as protection against wind-whipping during the winter months.

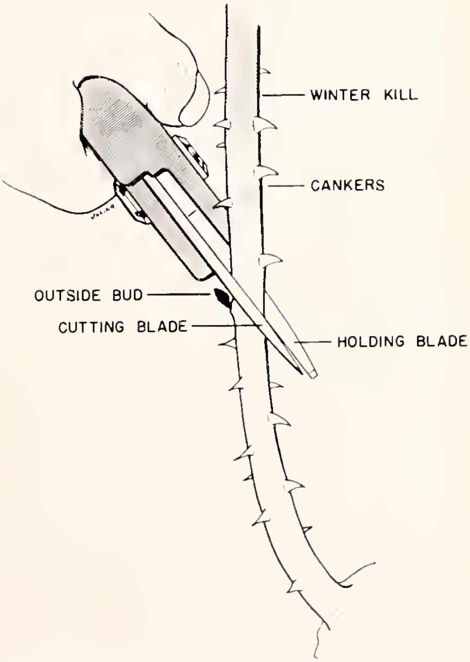
Spring pruning is delayed until the rose bush is about to break out of its dormancy. The time for pruning will vary from January in the warmer areas to late April in the very cold zones. In the latter areas the pruning is delayed until all winter protection has been removed during the latter part of March or early April. If the bushes are pruned too early, additional injury from repeated frost damage may make secondary pruning necessary. Pruning should not be delayed until the leaves have developed because of the loss of nutritive sap at this time from the cut surfaces of the canes.

Handling the Tools

The actual technique of pruning involves the proper application of the blades of the hand pruner to the cane (see illustration). It is extremely important that the cutting blade be on the lower side to insure a clean cut of the cane at least one inch below any visible canker. The narrow rim of injury resulting from the pressure of the non-cutting holding blade of the pruner, should be on the area of the cane which is to be discarded, as shown in the drawing below. The application of the cutting blade is more likely to be correct if the pruning proceeds in a clockwise fashion from left to right around the bush. The pruner should be applied parallel to the direction of the outside bud at an angle of 45 to 65 degrees (see illustration). It must be held firmly without twisting in order to cut the cane cleanly.

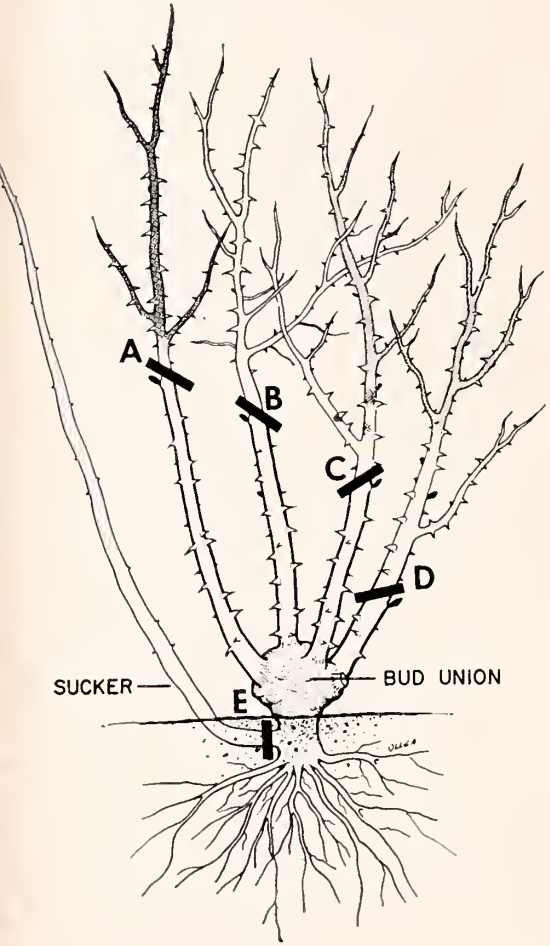
Aims and Methods

The primary goal of pruning is to remove all obviously dead, damaged or twiggy wood, leaving three or four canes as a foundation for a healthy bush of attractive shape and desired size. All dead wood should be removed by cutting the

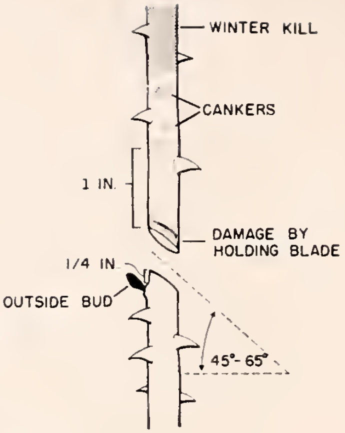


Proper application of the hand pruner to the rose cane. The cutting blade must be on the lower side to insure a clean cut.

canes at least an inch or more below the lowest point of visible injury. As much living cane as possible may be saved to encourage more and earlier blooms, as shown at "A" in the drawing below. Following a severe winter, all of the canes may need to be cut within several inches of the bud union. In warmer climates with little or no winter kill, only the twiggy growth and the cross stems are removed while the larger canes are pruned at the desired level to regulate the size and appearance of the bush (shown at "B"). Brownish discolored areas of various sizes on an otherwise green cane should not be overlooked since these are canker spots—damaged or diseased areas—which must be removed and destroyed (see example "C" in series). Although the outside of the cane may be green and appear to be healthy, you can't be sure until the pith is examined. In a healthy cane the pith tends to be creamy-white rather than gray or light brown. Though disappointing, it is necessary to prune a green cane almost to the level of the bud union when the color of the pith clearly indicates unsuspected hidden damage to this low level (as appears at "D"). Otherwise, a cane should finally be cut one-fourth inch above an outside eye or bud to encourage growth away from the center of the bush.

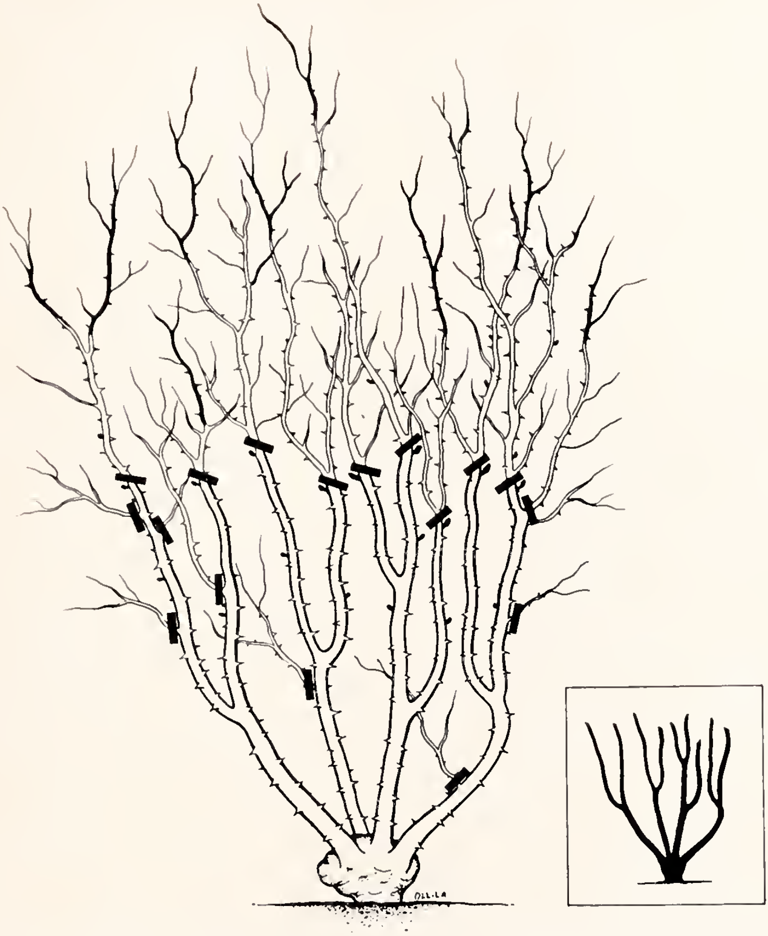


Principles of pruning Hybrid Tea roses: (A) high pruning for more and earlier blooms; (B) pruning to remove twiggy and cross branches; (C) pruning 1 inch below a canker; (D) severe pruning for removal of winter damage; (E) removal of sucker from understock. "Bud union" marks region at which plant was grafted.



Basic principles involved in pruning a rose cane.

Since each variety of rose has its own characteristics of growth, the pruner should take these into consideration. Some spreading types such as 'Crimson Glory' or 'Rex Anderson' can be made to grow more erect if the canes are pruned near an inside rather than an outside bud. The cut surface should be covered with tree seal or an asphalt compound to prevent



Principles of pruning a Floribunda. The cutting back of this class of rose is usually not as severe as on a Hybrid Tea.

drying out and subsequent damage by disease or cane borer.

Unwarranted severe pruning may cause damage and should be avoided until a plant is well established. However, in the presence of more than three or four large canes, the old ones should be removed near the bud union.

Occasionally a sucker or "wild" cane with leaves different from the rest of the bush will develop from the understock below the bud union (as shown at "E" in illustration). These should be removed as soon as discovered.

Pruning for Exhibition Blooms

When blooms of high quality suitable for exhibition are desired, pruning of the rose bush is more severe. Only three or four sturdy canes are allowed to remain and these are cut within 6 to 10 inches of the bud union. This type of pruning should be limited to vigorous and well established bushes. In addition, the new shoots on these canes, except for a few of the strongest ones, are pushed off with the thumb. Only two or three of the strongest buds are allowed to remain on each cane.

Although two or three shoots may develop from one eye on a cane, all except one of these are removed. It is preferable to carry out "thumb" pruning when the shoots are approximately one-fourth inch in length. Thumb pruning insures that the strength of the bush is directed into a few vigorous shoots rather than many.

Mid-season pruning to insure exhibition flowers for a fall show is commonly practiced. One or more canes are pruned back to about the size of a lead pencil or larger, approximately one-fourth of an inch above an outside eye. The canes may be cut at different heights seven to ten days apart in anticipation that at least one exhibition bloom will be available at show time. Each variety of rose requires a given number of days to develop from an eye into a bloom. Experience has shown that an average of 46 days is required from the time of pruning until the bloom is ready for exhibition in the North Central states. Summer pruning, therefore, is required from six to seven weeks before the time of the scheduled fall show.

General Practices

The pruning of Grandiflora rose bushes is similar to that of the Hybrid Tea rose.

Floribunda rose bushes as a rule do not require as severe pruning as the Hybrid Tea (see drawing, page 19). All dead wood and damaged or undesirably placed branches, as well as suckers, are removed. As much of the healthy green wood should be conserved as possible to insure clusters of flowers. Heavier pruning is carried out if flowers of exhibition quality are desired. The Floribunda bushes need more attention than the Hybrid Tea in developing flowers of good shape and pleasing proportion to the plant.

The individual rose grower will develop his or her own technique of pruning as experience increases. The better the care of the bushes during the growing season and the more they are protected during the winter, the stronger the bush will be after spring pruning. Pleasure and pride in growing roses are increased by proper pruning. ✦

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BUSH ROSES

(*Continued from page* 16)

er" at one end. With this convenient device it is possible to apply water effectively at the base of the plants without touching the foliage. For larger rose beds use canvas "soakers." These cloth hoses should be laid along the ground between the rose bushes, and water should be kept running for three to four hours (or more) in one spot.

Cutting Roses

Roses in the garden can pay extra dividends. That is, up to a certain point, the more roses one cuts, the more freely will new blooms develop to take their place.

Do not cut longer stems than necessary. Each node along a stem is the site of a new bud which will possibly become a branchlet, producing new leaves and flowers in its turn. All nodes that are cut off are lost to further production of blooms for the season. Cut June roses with short stems so as to leave the valuable nodes as a source of more flowers. When autumn comes, these nodes are no longer valuable and roses can then be cut with as long a stem as desired. If the flowers are left uncut, remove the old bloom, but leave the foliage undisturbed.

Certain species roses develop attractive fruits, or hips, of various colors in autumn. These make a nice display which enhances the garden until frost comes.

✦

CLASSES OF ROSES

Knowledge of classification a helpful guide to the nature and uses of plants

R. C. Allen

Drawings by Eva Melady

THE classification of roses is based on the grouping of varieties with similar characteristics and uses. In some instances the class name is based on habit of growth, such as Climbers, and in other cases on heredity or species origin, such as Hybrid Multiflora or Hybrid Rugosa. The names of some types are pseudobotanical, such as Polyantha, Grandiflora and the like, and some are merely garden terms like Hybrid Perpetual, Moss and Rambler, or based on common names such as Hybrid Tea. The terms "type" and "class" are used more or less synonymously.

Because of the numerous inconsistencies in the terms used, the classification of roses is difficult, especially on an international basis. It changes frequently and is often somewhat indefinite and variable. Not all hybridizers and nurserymen accept the same class names.

But in spite of the problems inherent in the present-day system, the grouping of rose varieties into reasonably well defined types is a handy tool even for the amateur gardener. It enables him to understand the similarities and differences in varieties so that if a rose is classified as a Hybrid Tea or Floribunda, for example, its general habit of growth, method of flowering and best use are immediately known. A clue to the culture of the plant may also be revealed.

In the horticultural classification of roses given here, the types are arranged more or less in order of their importance in the United States. The terminology is that in current American use.

Descriptions of classes that are becoming obsolete, largely because they have been replaced by improved varieties in groups of more recent development, are printed in smaller type.

Bush Roses—Bedding Types

The general designation "bush roses" encompasses all roses that in their normal habit of growth are upright and able to stand as shrubs without support. There are two main classifications — bedding and landscape types. Bedding roses are best used for mass color effects in more or less formal garden designs.

Hybrid Tea. The majority of the new

ROSE CLASSES ILLUSTRATED

Hybrid Tea

Floribunda

Grandiflora

Miniature

varieties introduced each year are Hybrid Teas, and they are the most commonly grown roses today, both outdoors and in the greenhouse. As a class they are comparatively new. Even though their forerunners began to appear as early as 1867, most of their development has occurred during the last fifty years. They should not be confused with true Tea roses, which are an older class and one of their progenitors.

Characteristics: Modern Hybrid Tea roses have a long pointed bud and a fairly high center when open. Most flowers are double, with 20 to 60 petals; some varieties, as 'Dainty Bess' and 'Innocence', are single or semidouble, with 5 to 10 petals. They bloom continuously with good culture, thus belying their earlier name of "monthly roses." Flowers are borne singly or in small clusters on long stems. Colors range from pure white through tones of orange, yellow and pink to deepest crimson and maroon. Mauve and lavender hues and brownish colorings have been introduced in recent years. Many varieties are fragrant.

Cultural note: Modern varieties are hardy in most sections of the United States, but in very cold areas some winter protection is required. Early disbudding is desirable to ensure one bloom to a stem and to give the highest quality of flowers for cutting and exhibiting.

Examples: 'Charlotte Armstrong', 'Crimson Glory', 'Confidence', 'Tiffany', 'Royal Highness', 'Peace', 'Sterling Silver'.

Floribunda. Well adapted to garden display because the blooms are borne in fairly large clusters; thus of more value for massed color effects outdoors than for cutting. The class was derived by crossing Hybrid Tea varieties with Polyantha, which produce small blooms in dense clusters. During the past 35 years the trend has been to increase the size of individual flowers and improve their form.

As a class Floribundas were not defined or the term used to any extent until about 1935. The late E. L. D. Seymour is credited with suggesting the class name. Since then the number of varieties introduced has increased rapidly until today they are second only to Hybrid Teas in production and popularity.

Characteristics: Diverse in form of flowers and habit of growth. Flowers single, semidouble or fully double, individually much like Hybrid Tea blooms, with same color range. Growth generally lower, bushier and more dense than that of Hybrid Teas.

Cultural note: Generally a bit hardier than most Hybrid Teas.

Examples: 'Betty Prior', 'Floradora', 'Pinocchio', 'Fashion', 'Jiminy Cricket', 'Ivory Fashion'.

Grandiflora. With the continual intercrossing of Hybrid Teas and Floribundas, a tall-growing intermediate type with flowers like those of Hybrid Tea has been developed. The new class was founded on the variety 'Queen Elizabeth', which is a strong plant producing tall candelabra-like growth. There has always been some question as to whether the Grandiflora type was sufficiently distinct from the Floribunda to warrant establishing it as a special class. On the basis of 'Queen Elizabeth' it is distinctive, but some varieties seem different only in size of bloom.

Characteristics: Plants somewhat taller than Hybrid Teas. Flowers slightly smaller, but larger than most Floribundas. Many flowers open simultaneously. While they appear to be clustered, each has a long stem of its own that makes it suitable for cutting.

Examples: 'Queen Elizabeth', Buccaneer', 'Carrousel', 'Montezuma', 'John A. Armstrong'.

Miniature. Similar in many respects to Hybrid Tea and Floribunda roses except in the diminutive size of flowers, leaves, stems and plants. While several rose species have produced exceedingly small forms, most of our present-day Miniature varieties are believed to have been derived from *Rosa chinensis minima* or from the interbreeding of contemporary Floribunda and Hybrid Teas. Hybridizing in recent years has greatly extended the color range.

Characteristics: Generally (though not officially) considered to be not more than 12 inches in height in a favorable climate, with flowers and leaves in proportion, the flowers not exceeding 1½ inches in diameter.

Cultural note: Most Miniatures are able to survive in a more rigorous climate than either the Hybrid Teas or Floribundas. They are also easier to grow than most other types.

Examples: 'Pixie', 'Red Imp', 'Cutie', 'Oakington Ruby', 'Opal Jewel', 'Miss Muffet', 'Rouletti'.

Polyantha. The Polyantha roses are low-growing, hardy plants which produce large trusses of small blooms almost continuously. In their time they were an important garden class because they were adapted to mass planting, but there have been very few introductions in recent years; the type has been largely merged with and superseded by the Floribundas. The term "hybrid polyantha" once used in the United States for the early combinations of Polyanthas and Hybrid Teas is still used in Europe for this class.

Because of certain special qualities, a few Polyantha varieties such as 'Cécile Brunner' ('Sweetheart Rose'), 'Margo Koster', 'Red Sweetheart' are still available.

Examples: 'Cameo', 'Gloire du Midi', 'Miss Edith Cavell', 'Chatillon Rose', 'Orléans Rose', Pinkie', 'China Doll'.

Hybrid Perpetual. From about 1850 to 1900 Hybrid Perpetuals were the dominant garden rose; some varieties are still grown extensively. But as a class they reached the end of their development in the early 1900s, being gradually superseded by the Hybrid Tea. The Hybrid Perpetuals were of complex parentage involving several species from Europe and China that produced a vigorous, hardy group of varieties with large, usually fragrant blooms. The term "perpetual" was somewhat of an overstatement because very few varieties bloomed with any degree of continuity, although some bloomed sparsely through summer and autumn.

Characteristics: Hybrid Perpetuals lacked the color range of our modern Hybrid Teas. While there were beautiful clear whites and rich dark crimsons, most of the pinks had a tendency toward bluing as the blooms aged. There were no bright yellows or blends except in a few that were more important for hybridizing than for garden use.

Some varieties such as 'General Jacqueminot' (the 'General Jack' rose), 'Paul Neyron', 'Ulrich Brunner' and others extremely popular in their day are still good garden roses except for their flower form which, by today's standards, is rather coarse. The continued popularity of 'Frau Karl Druschki', introduced in 1901, probably stems from its resemblance to the Hybrid Teas in flower form, since it has a high pointed center.

Examples: 'Baroness Rothschild', 'Clio', 'Henry Nevard', 'Georg Arends', 'Mrs. John Laing'.

Tea. Although Tea roses as a class reached the end of their development about 100 years ago, they are still grown to some extent in warmer sections of the United States and a few are still available commercially. The historic background and botanical relationships of the true Tea roses are obscure but it is generally assumed that they were derived primarily from the Chinese species *Rosa odorata,* with *Rosa chinensis* probably involved in some of the early hybrids. The name Tea comes from the odor of the blooms, which suggests that of crushed fresh tea leaves.

Polyantha

Hybrid Perpetual

Tea

China

The Teas were one of the parents of the Hybrid Teas, to which they contributed refinement in form, color, fragrance and above all continuous bloom. So imprinted is the name Tea in the mind of the public that even today many uninformed gardeners incorrectly refer to their Hybrid Teas as Tea roses, which they only vaguely resemble.

Characteristics: Varieties are usually in the lighter color tones and most are full and double. Petals are thin and lacking in substance, and the flowers are often somewhat nodding.

Examples: 'Duchess of Brabant', 'Lady Hillingdon', 'Maman Cochet', 'Marie van Houtte'.

China. The China roses, derived from *Rosa chinensis,* played an important part in the development of our modern varieties; but, like the Teas, they reached the end of their own development many years ago. They used to be called Bengal roses for their area of origin.

The first important variety was 'Old Blush', also known as 'Old Pink Monthly' and 'Old Pink Daily', both names designating its everblooming quality.

Characteristics: Colors largely white, red and pink, the blooms on some varieties deepening rather than fading as they aged. In recent years this trait has been strikingly brought out in such modern Floribunda varieties as 'Masquerade', also in 'Golden Slippers' and 'Zambra'.

Examples: 'Hermosa', 'Fabvier', 'Louis Philippe', 'Sanguinea'.

Bush Roses—Landscape Types

The distinction between "bedding" and "landscape" roses, while convenient, is at best arbitrary. Those in the landscape class, however, are larger and are best used as flowering shrubs in a landscape plan. Some may be used for bedding if kept heavily pruned, or grown as climbers if trained to an arbor, fence or other kind of support. But in the main they serve as individual, free-standing plants.

Shrub Roses. Since nearly all roses, botanically, are shrubs, it is somewhat redundant to recognize a shrub class in a horticultural classification. Furthermore, growth characteristics are often a function of culture and climate. Consequently the shrub class is a catch-all for varieties that do not fit well into any other common class.

It would be a much sounder practice to relate all shrub roses to their respective species origin, but this is not practical where characteristics of species are obscured by hybridization. Consequently there is need for a class called "shrub roses" to encompass those varieties which cannot be directly related to a botanical species and are best used for landscape purposes.

Examples: 'Golden Wings', 'Sea Foam', 'Gartendirektor O. Linne', 'Berlin', 'Mentor'.

Botanical Species. All roses found growing wild in some part of the world are classified as botanical species. In most instances they are relatively unchanged from the way they appear in their native state. A few in the class may be natural varieties or special forms of a wild species.

Characteristics: Botanical species are generally vigorous and tall. Most produce single flowers and have but one blooming period. The color varies according to the species and some produce attractive fruits.

Examples: Japanese rose (*Rosa multiflora*), rugosa rose (*R. rugosa*), prairie rose (*R. setigera*), Father Hugo's rose (*R. hugonis*), Austrian briar or Austrian yellow rose (*R. foetida*).

Species Hybrids. One large group of landscape roses consists of hybrids of species rather than of other hybrids. To be classified here, however, a rose that is a hybrid between one or more species must show its relationship to one species more than the other. For example, the rose 'F. J. Grootendorst' is a hybrid between *Rosa rugosa rubra* and a Polyantha. Characteristics of the foliage, prickles, habit of growth, et cetera, show its *Rosa rugosa* ancestry, so it is classified as a Hybrid Rugosa. 'Harison's Yellow' is believed to be a hybrid between the Persian yellow rose (*Rosa foetida persiana*) and the Scotch rose (*Rosa spinosissima*). While it shows characteristics of both parents, the flowers and other important features more strongly suggest *R. foetida*, so it is classified as a Hybrid Foetida.

Characteristics: As varied as the botanical species from which they were derived.

Old Roses. As a class, Old Roses are types that have reached the end of their development. This class can be defined only in a most arbitrary way because, given time, even the seedlings growing in the hybridizer's nursery today may eventually be classified as old. There is, however, a need for such a class for the vast number of varieties that cannot be considered in the same categories as our popular contemporary types. More erudite terms than Old Roses fail to convey the miscellaneous and indefinite characteristics of the group.

Numerous Old Rose types are of more historical importance than horticultural. They are roses that have paved the way for the modern hybrids. In their day they were popular garden varieties but in the last hundred years have been superseded by later developments.

The obvious question is, how old does a rose have to be before it can be classified as an Old Rose? Richard Thomson, one of America's most distinguished students of the group, has suggested 1900 as the dividing point of the old from the new. This is a reasonable point in rose history but it cannot always be taken literally where contemporary classes are concerned. For example, 'Kaiserin Auguste Viktoria', a Hybrid Tea still grown today, was originated in 1891.

It is not correct to call this class "old-fashioned roses"; whether a thing is called old or new is a point of view. When these roses were developed they were the latest creations.

From a chronological point of view, the Teas and China roses might have been included under the Old Roses. By definition they have some of the characteristics of the class but because they are still currently used in some volume as bedding roses in certain parts of the country it seems more logical to consider them under the bedding types. While this is a matter of opinion they seem a little more closely related to our current classes in growth and flowering characteristics and in use than do the types included under Old Roses. Examples of the principal Old Rose types are described below.

Gallica or French Rose. The Gallicas derived from *Rosa gallica* have been long in cultivation in Europe and were brought to America in colonial times. They grow to a height of about 3 feet and are bushy and stiff and very hardy. The leaves are rough and the plants bloom but once a year. A great many forms and colors were introduced. This is the species that produced many variegated roses such as "Rosa Mundi." As a type it entered into the development of many complex hybrids. Among the Gallicas are such epoch-making varieties as the rich violet-colored 'Cardinal de Richelieu'.

Damask Rose. Another European species that gave rise to many fine selections and hybrids was *Rosa damascena,* which itself was of hybrid origin with *Rosa gallica* as one of the parents. The plants are usually a little taller than true Gallicas, producing a loose, more graceful type of bush. The flowers are semidouble and in most varieties strongly fragrant with the true rose odor.

Examples: 'Mme. Hardy', 'York and Lancaster'.

Alba Rose. The Alba, or white, roses are tall flowering shrubs with large fragrant blooms. *Rosa alba,* from which they are derived, is a presumed hybrid of a Gallica.

Shrub

Species

Species Hybrid

Gallica

Damask

Many varieties were formerly produced and a few live on to this day.

Example: 'Maiden's Blush', a fine landscape variety.

Centifolia or Cabbage Rose. As with all these early species precise information on origin is not available. Derivatives of *Rosa centifolia* warrant a special class, however, because they are distinctive. As a class they are tall, large shrubs. The flowers are powerfully fragrant and the blooms are extremely double. A few dwarf or miniature Centifolias have been developed. Many varieties classified as Moss roses have come from this species.

Moss Rose. In designating Moss roses as a separate class, we must change from a species system of classification to a morphological one. The Moss Rose class includes all varieties that show mossy characteristics on the calyx. While many of the Moss roses were derived from *Rosa centifolia,* other species and hybrids have produced the mossy character.

Examples: 'Old Pink Moss', 'Crested Moss', 'Chapeau de Napoleon', 'Blanche Moreau'. New varieties have recently been introduced in Europe.

Noisette Rose. A hybrid group that produced many fine varieties were the Noisettes, which were developed from hybrids between the Musk rose (*Rosa moschata*) and *R. chinensis.* They are roses for mild climates since they all lack winter hardiness.

Characteristics: Plants are basically climbers but some of them become quite shrub-like if not supported. Flowers often fragrant, in large clusters, white, yellow, pink or red.

Example: 'Maréchal Niel'.

Some Descriptive Terms Not Used in Classification

Everblooming Climber: A Large-flowered or Rambler type of climber which blooms throughout the growing season.

Pillar Rose: A climber that does not make rampant growth, therefore that is suited to a post or pillar.

Semi-climber: A plant half way between a bush rose and a climber.

Tree Rose: A bush rose with a single trunk, the manner of growth artificially produced by budding the desired variety onto a tall understock. Synonymous with Standard Rose. Any bedding rose can be made into a tree rose.

Bourbon Rose. The Bourbon roses came into being when *Rosa chinensis* was introduced into Europe and hybridized with European species and varieties. The resulting hybrids became the forerunners of the Hybrid Perpetuals and contributed the repeat-blooming quality.

Many historic old Bourbons are still grown today.

Examples: 'Boule de Neige', 'Gloire des Rosomanes' ('Ragged Robin'), 'Souvenir de la Malmaison', 'Zepherine Drouhin'.

Alba

Centifolia

Moss

Noisette

Bourbon

Climbers

In the true sense of the word, no rose is a climber because it does not twine or produce holdfasts or tendrils to help it support itself on another plant or structure. Some varieties, however, do produce long supple canes that can be tied to supports and thus simulate a true climbing plant. The climbing habit of growth in roses is, therefore, largely a method of culture. If left to themselves the so-called climbing varieties would either sprawl on the ground, make a mound of brambles or develop into shrubs. Climbers, then, are roses that can be conveniently trained to cover walls, fences, arbors or other structures to which the canes may be tied for support.

Large-Flowered Climber. The most important class of climbers today is the Large-flowered type. The more modern varieties usually bloom abundantly in the spring and have some flowers throughout the season. While usually called everblooming, none of them flower as continuously or with the profusness of the Hybrid Teas or Floribundas. Plants have rather stout, stiff canes which grow from 8 to 15 feet long. The flowers are 2 or more inches across (in some varieties to 6 inches) and they are borne in loose, open clusters of from 5 to 25 blooms.

Examples: 'New Dawn', 'Dr. J. H. Nicolas', 'Blaze', 'Golden Showers', 'Pink Cloud', 'Spectacular'.

Rambler. One rather distinct type of climbing rose is the Rambler, recognized as a group since about 1900. Many Ramblers owe their characteristics to *Rosa wichuraiana,* which is practically prostrate. Other roses such as *R. multiflora, R. setigera* and many hybrids have entered into the heredity of the Ramblers. Ramblers have now probably reached the end of their development because with today's restricted space the need is limited for varieties of rampant growth. For the most part they bloom once during the season but a few may show some repeat bloom in the fall.

Characteristics: Long supple canes that normally require support for effective use. The flowers are usually small, 2 inches or less in diameter, borne in more or less dense clusters.

Examples: 'Dorothy Perkins', 'Chevy Chase', 'Excelsia', 'Hiawatha'.

Climbing Hybrid Tea. Occasionally a mutation, or change, in the growth habit will occur in a Hybrid Tea or other bush variety whereby long canes transform it into a climber. It then becomes classified as a Climbing Hybrid Tea (or Climbing Floribunda or other sort). All its other characteristics remain the same, though the flowering may be less profuse than in the bush form. Some have also been produced by breeding. Few varieties are satisfactory in cold climates without specific winter protection.

Examples: Climbing Hybrid Tea — 'Climbing Crimson Glory', 'Climbing

Rambler

Large-Flowered Climber

Climbing Hybrid Tea

Creeper

Peace', 'Climbing Mrs. Sam McCredy', 'Climbing Talisman'; Climbing Floribunda —'Climbing Pinocchio', 'Climbing Goldilocks'; Climbing Miniature — 'Climbing Pixie'.

Creepers and Trailers. The creeping and trailing roses are merely a subclass of the Ramblers and Large-flowered Climbers. The class is convenient, however, because it groups together varieties that are particularly useful for ground covers, growing on banks and in similar situations. In fact, virtually any Rambler is satisfactory as a Creeper, but some varieties are particularly meritorious.

Examples: 'Dorothy Perkins', 'Carpet of Gold', 'Coral Creeper', 'Max Graf', 'Mermaid', *Rosa wichuraiana.*

THE FUTURE OF ROSE CLASSIFICATION

THE American Rose Society has had an active committee headed by Dr. Griffith J. Buck of Iowa State College studying the problem of rose variety classification because there is a need for the development of a simple, meaningful, flexible system by which rose cultivars can be accurately grouped according to horticultural characteristics. Such a system would need to be accepted internationally to be effective.

With the interbreeding of all classes of roses it is now practically impossible to say where one class leaves off and another begins. Societies concerned with other single plant groups like the iris, peony, daffodil, dahlia and gladiolus have been confronted with the same problem. All have scrapped the old systems and developed entirely new ones. They have discarded botanical relationships as a means of classification and have based their new systems on consistent morphological characteristics such as size, flower form and habit of growth or flowering. Eventually such a method of classification will have to be established for roses.

LANDSCAPE

(*Continued from page* 9)

Other Uses of Roses

Windows and doors of many houses, especially at rear and sides, are arranged to suit the interior plan with little regard for outside appearance. In such places, often a trellis or other support for climbing roses can artfully improve the architecture, while the roses make it appear as purely decorative.

Near a porch or patio, a bed of roses can add color and fragrance. Choose low or tall varieties in relation to the attractiveness of the view. Climbing roses are useful when quick, dappled shade is wanted. They combine happily with any style of house and supporting structure.

We have all seen roses well used in foundation plantings, as specimen shrubs, for ground covers, on walls, fences and arches. Miniature roses fit well into rock gardens; "tree roses" are suited to formal patterns. The garden designer is more likely to find a limit to his own art and imagination than a limit to the usefulness and beauty of roses in the home landscape. ✦

* * *

CLIMBING ROSES

Richard Thomson

THE first garden roses used as climbers were certain wild species of western Asia and Europe. Their long canes and somewhat lax habit of growth made them suitable for training as espaliers and for tying up on other types of support. But these are scarcely known today; their flowers were small, mostly five-petaled, and they bloomed only once.

The development of the modern garden rose can be said to date from shortly after 1800. By this time, oriental roses had been brought to the West and all of the parental stock necessary for breeding today's climber was available. However, the production of these climbers has taken a full century and a half. Many strains and types have been combined to give the really wonderful roses that now grace our fences, arbors and lattices. The flowers are brilliantly colored and superb in form. The army of workers and hybridizers whose cumulative efforts have made them available deserve the gratitude of gardeners.

Generally speaking, climbing roses fall into three rather loosely defined groups, each requiring different handling and care. The first group includes climbers which rather closely resemble a wild or species ancestor; the second, those which are several generations away from the wild; and third, those which are completely hybrid—in short, the best climbers of today. The first two types are now almost anachronistic, but since they are still grown, they will be described here. In my childhood, only the first two groups existed, and some who read this will remember when only the first was widely grown, for the development of the modern climber does not go farther back than 1880.

Climbers from the Wild

Group One is based upon the Japanese species *Rosa wichuraiana,* and to a lesser extent upon the Chinese *Rosa multiflora* and *R. soulieana.* The Japanese rose is a trailing plant with small, glazed foliage and clusters of small, single, white flowers a bit after the usual rose season. It has little value in itself, but when bred with garden roses early in this century, it produced a myriad of varieties which became known as Rambler roses. As a group they retain the lax habit and cluster-flowering of the parent and train well. The colors are rather limited, ranging from the deep red of 'Chevy Chase' through the weak pink of the ubiquitous 'Dorothy Perkins' to the peachy yellow of 'Aviateur Blériot'. These are period pieces today. While they still exist in gardens, they are rarely planted. If allowed to go without care or pruning, they become mildew-laden tangles. Sprayed regularly and pruned adequately, they can be attractive garden plants. After blooming, it is best to remove all old canes down to the base of the plant. This allows the rose to renew itself completely each year.

Jackson & Perkins

Early Hybrids

Group Two is the obvious result of the hybridists' attempting to improve Group One. The roses are a generation or two farther along and have larger flowers in clusters of fewer blooms. Most of them are large growers and much more erect than the small-flowered Ramblers. The two classic prototypes are 'Dr. W. Van Fleet', a pale pink of good form on a rampant plant, and 'Paul's Scarlet Climber', with bright red flowers. Though both of these derive from the Ramblers, they should not be cut back to the base each year after flowering. It is not simple to give easy rules for pruning this type. It is best, perhaps, to remove wood three or four years old at regular pruning time (after blooming). Such plants bloom best on wood which is somewhat younger and more viable, but not on new wood. By and large, roses in this group bloom once, but occasionally they may show scattered later flowers. I am thinking particularly of 'Mary Wallace' and 'Dr. W. Van Fleet'.

Everblooming Climbers

Rarely, a rose variety will mutate. This means that a branch of flower unlike the rest of the plant is spontaneously produced. If propagated, the mutant branch will usually reproduce the abnormality. Mutations are also known as "sports," and such a sport was the beginning of Group Three. When 'Dr. W. Van Fleet' sported a completely everblooming branch, and it was propagated and introduced as 'New Dawn' in 1930, it was indeed a new dawn for climbing roses. At last the hybridist had a hardy, large-flowered climbing rose as parental stock from which to breed. From this rose have been developed many fine modern climbers in all gradations of color, and all are rebloomers. These roses can be handled as the gardener wishes, for old wood that has not been pruned away will produce flowers late in the season. Ordinarily, wood of three years (or less) blooms better, but the rule is only a general one.

Climbing rose and split-rail fence make good companions along a property line.

Conard-Pyle

By now, 35 years after 'New Dawn' was introduced, many other strains have been incorporated into the "bloodstream" of the modern Climber. The climbing sports of the Hybrid Tea roses, themselves simply much larger bushes of this dwarfer counterpart, have been bred into the 'New Dawn' strain. There is a consequent slight decrease in winter hardiness, but not enough to cause trouble except in severely cold climates. Most of the Climbing Hybrid Teas are hardy to zero or slightly below, and the modern climbing hybrids to at least 10 degrees lower. These varieties, which owe something to the Floribunda class, have lost nothing hardiness-wise, and have gained great trusses of smaller flowers in bright colors.

One relatively new class of climbers has come from Germany in the past ten years. Developed by Wilhelm Kordes, one of the greatest living hybridists, it derives from a rare seed mutation which was named *Rosa kordesi* in his honor. From this quasi species, Kordes has developed a series of low climbers or large shrubs which are completely everblooming, very hardy, and in the complete range of colors. These roses deserve wide use for they are nearly "foolproof."

Culture as for Bush Roses

Culture of the climbing rose is the same as for bush roses, for after all these are merely larger bushes. Given good care, being pruned regularly as directed, and restrained from getting out of hand, they will bring delight for many years. ◆

MINIATURE ROSES

Margaret E. Pinney

PUBLIC interest in miniature roses has grown steadily since the 1950's. The result has been an increase in the number of varieties available and a much broader color range.

Miniature bush roses range in height from about 4 to 18 inches; "climbers" to about 5 feet. (These do not climb, but sprawl, and need to be tied to stakes.) Miniature tree roses are created by grafting dwarf roses 8 to 12 inches above the ground on a rooted stem of a Multiflora or other rootstock rose. The little tree roses are not reliably hardy in a cold climate and must be well protected in winter.

Miniature roses are called Hybrid Chinas because *Rosa rouletti*, the remote ancestor of most of them, is of the China-rose type. This class is very nearly everblooming. Leaflets are small and dainty, buds and flowers rather loose with not many petals and little fragrance. In the early nineteenth century such roses were very popular and there were over a hundred varieties in Europe and America. When the Polyantha roses appeared, at the end of the century, fewer Miniatures were grown. In the first two decades of the twentieth century only a few kinds were available. The story of their revival is romantic.

Origin of Modern Miniatures

About 1915, a certain Major Roulet found a 3-inch rose plant growing on the window sill of a Swiss cottage. The owners said that it had been grown by the family as a house plant for a century. Major Roulet took cuttings of it to the Swiss nurseryman, Henri Correvon, who propagated it and sold the plants in Europe. In 1934, Robert Pyle, in search of new roses for his firm, found his friend Jan de Vink of Boskoop, Holland, breeding new varieties by crossing this small rose, by then called *R. rouletti,* with other roses. Mr. Pyle brought some of these Miniatures back with him, and so started our little roses on their way. Europeans and Americans have experimented with breeding Miniatures with larger roses and with one another for the past thirty years until now there are more than two hundred varieties. Because of the great mixture in their ancestry, some of the Miniatures bear little resemblance to the original Chinas. But all are attractive in their different ways.

Nearly all of the modern Miniatures are hardy outdoors. 'Perla de Alcanada', a strong thorny crimson, will survive a

Conard-Pyle

A ceramic container such as this can be planted with one or many varieties of Miniatures.

Arrangements with Miniatures: *Left: Rosa rouletti; center: 'Perla Rosa'; right: 'La Presumida'.*

Morse

temperature of 20 degrees below zero, but 'Diamond Jewel', a dainty small white, needs protection at zero.

Outdoor Care

In a cold climate, it is best to mulch all Miniature roses. Do this just after the ground freezes. If a mulch is put down too early, mice and moles may tunnel under it. Many types of mulching material can be used, but one that is already rotted is best because it will not rob the earth of nitrogen as it becomes integrated with the soil. Peatmoss or weathered animal manure mixed with coarse gravel or Perlite to prevent it from caking is a safe and easy mulch. It will not look unsightly, and can be dug in around the plants in late spring. Many other mulches, such as wood chips, salt hay, and buckwheat hulls are best removed in spring as they tend to retain their original form. In hot summer weather, however, a slightly lighter mulch of the kind used in winter will help to hold soil moisture. A mixture of one part each of peatmoss, coarse sand and garden loam is practical.

Miniature roses — like big roses — do well in a well-drained soil rich in humus and slightly acid. Use plenty of humus —compost and rotted manure, peatmoss, or a mixture of all—with about one-sixth part coarse sand. Mix in one-half pound of bone meal for each square yard of garden. If the soil is too acid, add 3 to 5 pounds of garden lime to every 100 square feet.

Miniature roses must have adequate moisture, and should never be allowed to dry out completely. On the other hand, the roots will rot if they are kept constantly wet. Water them thoroughly only when the surface of the soil has become dry, and try not to get water on the leaves, as this promotes the spread of disease.

Miniatures thrive and bloom with only six or seven hours of sunshine a day, though more is not harmful. In a warm climate they do better if they are slightly shaded during the hottest hours.

Outdoor roses should be fed three to five times during the growing season, after the first leaves unfold. Excellent results can be obtained with fish emulsion (two thirds of a tablespoon to a gallon of water, sprinkled on), but many good commercial rose foods are available. It is important to follow directions exactly.

Feeding should be stopped about two months before hard frost is expected, to give the fresh green growth time to harden off before winter.

Indoor Culture

Indoors, Miniature roses can be grown in a greenhouse, on window sills, or under artificial lights. A greenhouse is fine, but not required. Window sills involve some hazards, but these can be overcome. A double-glass picture window is best. But if only a single glass, with cold air leaking in around it, is available, fold a stiff sheet of plastic, set the pot on one side of it and bring the other side up next to the window to an inch above the top of the pot.

Gas leakage kills roses quickly. One remedy is to keep the pots as far away from the source of gas as possible. Another is to put a bell glass over the plant.

Drainage is even more important under the artificial conditions of a house than it is outdoors. Plants must never be completely dry, but contrariwise, pots containing them must not be left sitting in water. Empty the saucers an hour after watering. A good way to prevent waterlogged roots is to set the pots in a pan or window box containing large pebbles. Keep the water level below the top of the pebbles; when watering, never let the liquid reach the bottoms of the pots. Under artificial (fluorescent) light, roses grow fast and appear to have fewer troubles. Tests should be made to determine the correct distance from the lights and the length of time the lights should be on, as varieties respond in different ways.

Feed indoor roses every two weeks in fall and spring. From November to February, fertilizing every three weeks will be adequate.

Keeping Plants Pest Free

Many people deny themselves the pleasure of growing these delightful plants because of the possibility of pests and diseases. Actually, such troubles are few, and a little care easily overcomes them. The common insect pests are aphids, whitefly and red-spider. All can be banished by one to three sprayings with malathion. Mix this insecticide carefully according to directions, tie a handkerchief over your nose to avoid inhaling the fumes, and spray the stems and both sides of the leaves. Repeat this a few days later and, if necessary, a third time. To avoid burning the leaves, do not spray in bright sunshine. The common diseases are mildew (like gray wool on stems and leaves) and blackspot (dark blotches on the leaves). For these a rose dust is best, and there are several good ones available at garden supply stores, all easy to apply.

Miniature roses have a special appeal because they are dainty yet hardy, nearly everblooming, and available in many colors. To the gardener with limited space, they are a godsend. ✦

Miniature roses lend themselves well to container culture.

Conard-Pyle

GROWING ROSES IN CONTAINERS

Peter Malins

ROSE lovers without gardens can derive a great deal of pleasure from growing roses in containers. Given the necessary enthusiasm, imagination, and modest horticultural knowledge, they can achieve highly satisfactory results.

The technique is similar to that used in growing other plants on a window sill, but a minimum of four hours of direct sunlight is essential if the plants are to bloom. Locations that immediately suggest themselves are strips of land at the front, rear or side of the house, open porches, terraces, roof gardens and patios. In all these situations, the plants must be protected against direct wind.

Containers

The best containers to use are of porous clay or durable wood such as redwood or cypress. Stone and metal containers are not desirable because unless very light soil (high in sand) is used, the roots of the roses do not get sufficient air. A clay pot 12 inches across and 12 inches deep is about the smallest size that is suitable for a single rose plant. Ideal wooden containers for a single plant are a round tub of the dimensions given above, or an octagonal tub 13 inches high and 15 inches in diameter. Climbing roses need more root room. A square or octagonal wooden container 18 inches high and 33 inches in diameter is right for them. A satisfactory window box size would be 13 inches wide, 14 inches high, and 3 or more feet long. These dimensions are related to satisfactory over-wintering. For Miniature roses, the boxes can of course be much smaller.

Soil

Use the soil of your own grounds or garden for three-fourths of the needed amount; for the other one-fourth add a mixture of equal parts of peatmoss (or compost) and sand, plus two or three handfuls of bonemeal or dehydrated cow manure in each container.

Armstrong Nurseries

Hybrid Tea 'Charlotte Armstrong' is a satisfactory variety for container culture. Wooden container at right is obtainable at most garden supply centers.

Materials and Planting

Best results are obtained by planting bare-root material within two or three weeks after the frost is out of the ground. In the New York area, this would be the end of March or the first part of April. Fill the bottom 2 or 3 inches of the container with crunched flower pots, gravel, or stones. Pile a cone of soil no more than 6 inches high on top of that. The crown of the plant may now be seated firmly without forcing the roots into an unnatural position. Place soil around the roots and tamp it firmly to avoid air pockets. Now fill the container with soil but leave 2 inches below the rim to allow for watering. In mild climates the bud union should be just above ground level after the potting soil has settled. In cold regions, the bud union should be about 1 inch below ground level for winter protection. After planting, apply water until it runs out of the drainage holes in the bottom of the container.

Summer Care

Roses grown in containers should be kept in the sunniest place possible. Provide for the retention of moisture by working about an inch of mulch into the surface of the soil in the container, but avoid keeping the soil soaking wet. By watering thoroughly, then allowing the excess to drain out of the container, moderate dampness with good aeration of the soil is assured. Keeping the foliage as dry as possible when watering roses will help to avoid fungus diseases.

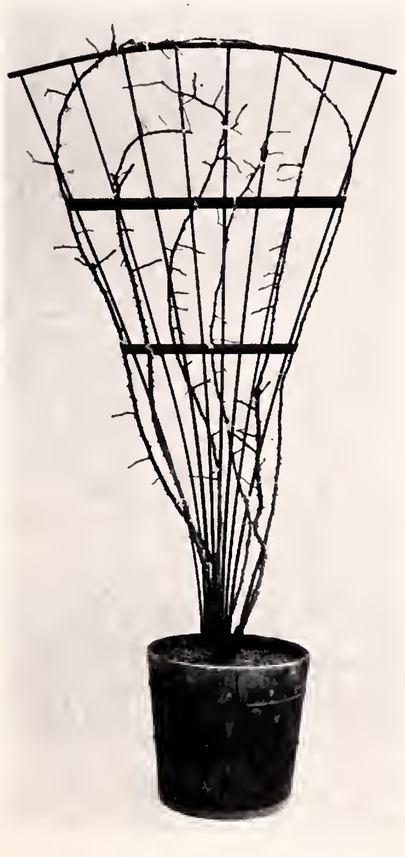
Fertilizing

For most soils, as least in my experience, a 7-8-5 fertilizer gives the best results. Apply it at least three times a season at the rate of 1 to 3 tablespoonfuls per plant, depending on the size of the container. Mix it into the top inch or so of soil, then water the plant well.

Controlling Pests

One of the best insecticides for roses is Isotox garden spray; for control of fungus diseases I use Phaltan. The two can be mixed together advantageously, and applied as a single spray every two weeks

(*Concluded on page* 81)



Left: Climbing rose in a container after spring pruning; *right:* the same rose in August.

EXHIBITING AT ROSE SHOWS

Flowers of prize-winning calibre demand the best in culture and handling

Harold E. Weaver

An exhibition rose should have abundant petals symmetrically arranged in a pleasing circular outline with the center high. At the time of judging it should be at its most perfect phase of beauty, preferably one-half to three-fourths open. It should have good substance, and the color should not only be pure but typical of the variety. The stem should be neither too long nor too short for good proportion, and strong enough to support the bloom without undue bending. The foliage should be in complete balance with the stem and bloom and should be clean and free from disease or injury.

These specifications rule out roses of irregular form, with split or balled centers, faded or poor color, and damaged foliage or bloom. Because such flowers do not meet show standards, they are immediately eliminated as potential blue ribbon winners. Also, after a bloom has lost its high center it is no longer a true exhibition rose, for it does not meet the requirements. The petals should be long enough to keep the bloom from looking flat when opening even if it does maintain a high center.

Qualities of Winners

Moisture and plant nutrients control the freshness and firmness of the petals of a rose, its clarity of color, and the stability and durability of its form. It is these essentials that give a flower *substance*. Show roses should always have a crisp, fresh appearance. If a bloom is lacking in moisture and nutrients, the petals may droop and the color be poor. Stem and foliage will also flag if sufficient moisture is not present.

The stem should be straight and erect with the foliage so spaced as to enhance the bloom. Basal canes are usually too coarse to be considered show material. Preferred stems are usually obtained from the growth of laterals which have emerged from a strong cane pruned back for this purpose.

The foliage should be of sufficient size to give the stem a well-clothed appearance. Very small leaflets sometimes make a stem or plant appear straggly. This is a fault. Stems with fewer than two sets of five-leaflet leaves below the bloom are generally considered to have insufficient foliage.

The size of the specimen selected should be typical of the variety when grown under ideal cultural conditions. Most exhibitors do not permit more than two laterals to grow from any one basal stem. Some allow only one to develop. However, if a plant is heavily fed and forced too much, the bloom is often coarse and may even be of poor color.

Advance Planning for Show Blooms

To get choice show specimens we must plan in advance for disbudding and for protecting the blooms and foliage from damage by wind and rain, insects and disease. When disbudding, if only one or two side buds have appeared, remove them as soon as possible. If there are more than two, use another stalk.

Wind damage may be avoided by erecting a temporary windbreak near the rose bed on the side of the approaching wind. Saran cloth is excellent for this purpose. Rain damage to an opening bloom can be prevented by placing a shade over it when needed. The same shading can be used to keep delicate colors from fading. In some sections of the country, rose bonnets are used to good advantage over the yellows, mauves, and some of the blends which fade the most.

Conard-Pyle

Flowers one-third and one-half open—examples of perfection in show blooms

Color is important when a rose is being judged; it counts for 25 points. Other points are: form, 25; substance, 20; stem and foliage, 20; size, 10. Many shows now have classes for both bud and open bloom.

Handling Exhibition Flowers

In some varieties the outer couple of petals often have a white streak in them. These may be removed if the form of the rose is not altered thereby and the place of removal does not show. 'Charlotte Armstrong', 'Chrysler Imperial', 'Mirandy', and 'Poinsettia' are examples of roses with this trait. Sometimes a short or undeveloped petal occurs deep within the bloom. This may be removed and the form corrected. A rounded and beveled type of tweezer is recommended for this operation.

There are many theories about when a bloom should be cut to achieve the best keeping qualities. Although the sugar content is highest at about 3 or 4 o'clock in the afternoon, it is not practical to cut outdoor-grown roses then because 90 per cent of the opening of a bloom occurs between the approach of dawn and 10 a.m. Therefore, early morning is by many considered best.

As soon as a rose is cut, it should be taken inside and placed in a bud vase filled with water. It can then be cleaned of all spray and dust residue and given a partial grooming. As soon as this is completed, it can be placed in a refrigerator until show time. To remove difficult residue add a little liquid detergent to the water. A small, long-handled bristle brush is ideal for cleaning the stem and thorns; a damp piece of cotton is good for cleaning the foliage. No oils or fats are permitted in cleaning foliage; their use often causes an entry to be disqualified.

Although many exhibitors depend upon refrigeration to keep their roses fresh from time of cutting until show time, other methods can be used for shorter periods. At least eight hours should be allowed for conditioning, regardless of the method employed. On the other hand, it is impractical to hold roses more than three or four days before the show, for the longer a rose is kept the more likely it is to lose substance and color. After two days, a quarter-inch should be cut off the stem so that the intake of water is not impaired. The ideal temperature for conditioning roses is from 34 to 38 degrees Fahrenheit. The longer a bloom is to be kept, the tighter it must be when cut because it expands and grows, though slowly, even during refrigeration.

An insulated picnic chest, long enough to accommodate the length of stem to be used for showing, makes an ideal transporting case because it can be kept cool. It is a necessity if roses must be taken long distances, unless florists' wax paper is wrapped around the flowers and no moisture is retained inside. For local use, any device with a cover to protect the bloom will do.

Rose Show Procedure

When you arrive at the show, obtain a

Conard-Pyle

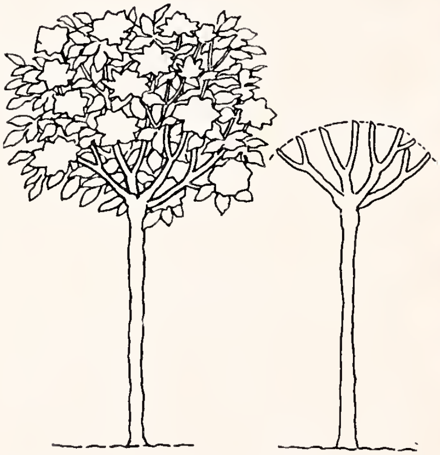
A rose of exhibition quality, a full three-fourths open, with a bud

schedule and entry tags and fill out the tags as completely as possible before opening up your box of roses. Recut the lower ends of the stems before placing your entries in their respective vases. Then check and groom them before leaving them with the entry committee.

The bloom should now look as it would if grown to this stage in your garden under ideal conditions. If you study your roses and know how each variety unfurls and lays back its petals, you will have a store of information hard to surpass. Your intimate knowledge of every rose you grow and show, and how it will perform under all conditions, will largely determine your success in exhibiting roses. There is no substitute for knowledge gained through experience.

When the show opens, study all winning entries and you will be still better prepared for competing in future shows. ◆

* * *



A tree, or standard, rose like 'Spartan' (right) can be made by budding a selected variety onto a tall, sturdy understock. When cold weather approaches, branches are pruned to about 12 inches. Protection is needed (see page 56) except in mild climates. In spring, branches are thinned and pruned again, this time to 8 or 10 inches to induce heavy flowering.

OLD ROSES FOR TODAY'S GARDENS

Dorothy Stemler

GARDENERS with imagination and a sense of adventure can find among the old-fashioned and the species roses a wealth of inexpensive plants for the creation of gardens of originality. Used appropriately, these roses can enhance any planting, whether it is large or small.

Their beauty is not in the flowers alone. The foliage may be colorful or delicately patterned or heavy. Some shrubs produce great masses of spring blooms, followed by bright-colored hips. Others bloom repeatedly. Forms, colors, fragrances are found among them that are unknown in today's hybrids. Living works of art, each reflects the taste and fashion of its era and recalls the country of its origin.

Recently a woman said to me wistfully, "I don't suppose there are roses suitable for an oriental garden." Ah, but there are! I mentioned the Father Hugo rose (*Rosa hugonis*), a species discovered in China. For oriental surroundings it is as suitable as bamboo. It has great arching canes, bearing foliage as delicate as maidenhair fern. In the spring the canes are covered along their entire length with small, cupped, single, yellow flowers. Then, when it finishes blooming it grows new canes that are red and covered with red prickles. Even this does not end the display. In the autumn the foliage turns to colors ranging from copper through pink. And *Rosa hugonis* is extremely hardy.

Very hardy, too, is the rugosa rose, also from the Orient. Varieties of it were found in northeast Asia and brought to America by Yankee skippers. They flourished and eventually became naturalized. Large fields of them can be seen along the New England coast, for the salt spray does not bother them. All the named varieties are distinguished by heavy, deeply ribbed foliage, much like mint leaves, encircling groups of short-stemmed flowers to form natural nosegays. The flowers are intensely fragrant, nearly 3½ inches across (double in some horticultural varieties) and they range in color from white through mauve-pinks to red. When their petals fall, hips form and ripen to look like cherry tomatoes. These hips have been found to contain, by weight, more than ten times the vitimin C content of oranges.

Morse

The Father Hugo rose (*Rosa hugonis*) has delicate leaves, single yellow flowers and red canes. Warm foliage color in autumn.

While the hips are ripening a new flower stem grows just below them on the same cane, so the plants are always in bloom until they go dormant. For close plantings, to mold the landscape, they are invaluable, and they can be pruned or even clipped to make a hedge. Some grow to four feet or more, while others are low growing.

There are in cultivation species roses that are native to all parts of the world, and many of these—too many to mention in this short article—are valuable for landscaping. Among them, the Austrian copper rose (*Rosa foetida bicolor*) stands out as having the most brilliant flowers in the rose world—single, with petals orange-scarlet or coppery inside and yellow on the reverse. *Rosa soulieana* from western China makes a useful ground cover. It produces branches up to 30 feet long which cover the ground and take root. The single one-inch white flowers in large corymbs are followed by clusters of small orange hips.

Most of the roses known in Europe up to the late eighteenth century have the native *Rosa gallica* as a common ancestor, though the damask rose (*R. damascena*) was brought in from Asia Minor in the 1500's. Except for the autumn damask, these early cultivated roses have but one annual flowering. Several species cross-pollinated naturally with *Rosa gallica* and brought forth new types. Others, such as the moss roses, have arisen as sports. Those derived from autumn damask roses bloom repeatedly. The Centifolia moss roses have only one annual flowering, but they are more beautiful and have greater refinement. These are all available today.

The Gallica roses and their descendants all have a heavy, rich fragrance which perfumes the air. Being winter hardy, they become large shrubs and bloom profusely. In climates where the growing season is short they are most valuable, for they bloom for two to two-and-a-half months during the summer, so all that is missed is the fall flowering. An indica-

Rosa centifolia in a planting of historic roses in Descanso Gardens, La Canada, California, where an assemblage of 8,000 plants represents the kinds of roses grown since the beginning of the Christian era

Courtesy of Los Angeles State and County Arboretum

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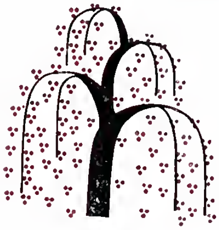

A semi-weeping flowering crab apple, hybridized and patented by the Botanic Garden. Selected trees, approximately 10 years old, available in tubs. Outstanding qualities—white blossoms in spring—magnificent autumn display of miniature fruit that hang in cherry-like clusters. Its characteristic irregular growth gives it special charm. Lends itself well to pruning in various styles. Also balled and burlapped specimens for sending to distant points. Packing and shipping charges extra. Orders and inquiries should be received by early December.

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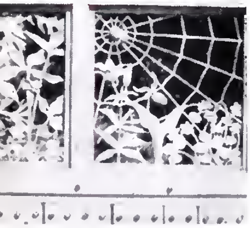

Dimensions 17" by 17"; each weighs 17 pounds. These two-faced panels are the work of Garden Artist Eva Melady. Originals are set in the Stutzer Memorial gate to the Botanic Garden's Woodland Garden. Both designs are framed by a narrow bronze strip, ready for use; antique weathered green. Both sides are "front." Plants in the designs include wood lily, moccasin-flower orchid, hepatica, Jack-in-the-pulpit, oak and pine.

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◆

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tion of hardiness in different types of roses is whether or not they have the ability to go dormant and stay dormant during alternating growing and freezing weather in the spring. Even in California the very hardy roses are just beginning to show a swelling of the leaf buds when the more tender varieties are in flower and leaf bud.

In the late eighteenth century everblooming roses were discovered in the subtropics of China. When brought to Europe these more or less tender species were crossed with the Gallica descendants. The new types that resulted bloomed repeatedly: Portland, Bourbon, Tea, Hybrid Perpetual, Climbing Tea, Noisette, finally the Hybrid Tea roses so popular today. 'La France', which will be 100 years old in 1967, was the first rose to be called a Hybrid Tea.

Because they have the tender Tea or China roses in their ancestry (as well as the Gallica strain), the Bourbon, Portland and Hybrid Perpetual roses are less hardy than other Gallica descendants, but still more hardy than Hybrid Teas and other modern types. The only one of these roses I know that is not fragrant is 'Frau Karl Druschki'. Some of the most delightful perfumes in the rose world are produced in the Bourbon, Portland and Hybrid Perpetual roses.

Since the Tea, Climbing Tea, and Noisette roses are direct descendants of the tender roses from the subtropics of China, they are best used only in mild climates. They all have what is known as a tea fragrance, often fruity, and always light and delicate. Where winters are mild, they become large plants the new foliage of which is often as colorful as the flowers. And they are always in bloom.

The species roses and old roses are available from some nurseries. The few in the United States which specialize in them carry many kinds. Some nurseries grow a limited number of varieties, chiefly for their value as shrubs. Any of these roses will add a depth of interest to a garden, and open up a whole new world of roses for the hobbyist. ✦

Tillotson's Roses

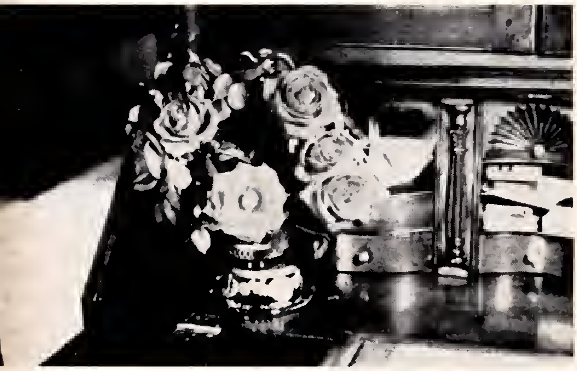
'Celsiana', a variety of the damask rose (*Rosa damascena*) has been cultivated since the 18th century. Its crinkled petals are pale pink, foliage is grayish and fragrant.

'Duchesse de Brabant' is a very fragrant pink Tea rose, with typically arching flower stalks.

Moss roses, characterized by prominent glands that give a mossy effect on the sepals, arise as sports on several species.

ROSES IN THE HOME

Wanda M. Lemon



Ruth Gannon

THE skillful arrangement and placing of even a few roses will transform any room, and the fortunate possessor of a rose garden can multiply the pleasure it affords by regularly bringing some of its fragrant blooms into the house to become an integral part of the indoor scene.

With colors that range from vibrant copper and more subtle terra cotta to clear yellow, from rich maroon through all the reds to dusty and shell pink and lavender, and from delicate ivory to white, a rose to harmonize with any interior color scheme is almost certain to be found.

A vase of glistening greenery combined with roses can enhance a formal area. A single rose carefully placed can emphasize with its color the lived-in quality of an informal one. A favorite painting, tapestry or decorative print can be given a new dimension in brilliance and importance by repeating its colors with roses, and the burden of humdrum chores can be lightened by the magic of a rose on kitchen window sill or desk.

A ring of greenery in a low bowl will provide an excellent base for short-stemmed roses. With candles held in place with florist's clay, the effect on the dinner table can be glamorous. At breakfast time, a cluster of miniature rose blossoms placed in an egg cup by one of the children will help to start the day pleasantly for the family. Among the most enchanting are 'Scarlet Gem', 'Cinderella', 'Red Imp'. Starting with simple arrangements like this, the smallest child can soon develop creative ability.

First impressions are often lasting ones. An entrance hall that reflects warm hospitality with ivy and roses, perhaps in a cherished teapot on a console or low chest, will be remembered by guests. For spring, 'Golden Showers' would be appropriate; during summer's heat 'White Knight' or 'Sea Foam'. If a more colorful, sophisticated approach is preferred, the choice might be exotic croton or caladium leaves in a bold ceramic container with luminous 'Tropicana' roses or crimson-red 'Mister Lincoln'.

Whatever the style of the furnishings, roses can be used to emphasize its decorative quality. A comfortable colonial interior might call for rose arrangements in family treasures and heirlooms—antique ironstone, pewter and silver, for instance, to create a duet of beauty. Scandinavian décor is keyed to the modern mood of simplicity. A rose arrangement to suit it

Conard-Pyle

Miniature roses for the breakfast table.

should be bold, forceful and uncluttered. Dramatic foliage placed vertically as a backdrop for the robust color of 'Chicago Peace' or 'Sutter's Gold' interprets this modern mood.

With French Provincial style, formality is the keynote. The soft pastel lavender of 'Sterling Silver', delicate ivory of 'Garden Party' or perfumed pale pink of 'Royal Highness' arranged in pyramid form in exquisite alabaster or in Haviland china or Limoges ware would fit such a room.

Elaborate Spanish furnishings demand our most brilliant hues to complement the Moorish influence. For Old World charm, nasturtium-red 'Granada' with holly-like foliage, or brilliant orange 'Zambra' achieves a dazzling effect when combined with black wrought iron.

Many decorators today are looking to the Far East to reflect oriental influences. A classic-appearing rose such as 'Camelot' or one with the rare beauty of 'Confidence' blends readily into the balance and harmony of oriental flower art. To follow the principle of emphasizing the natural lines of branches and foliage means that fewer flowers are used. The artistic creation thus achieved can be one of exquisite simplicity.

During the late fall and winter, with summer's luxury of rose abundance past, we must depend upon the local florist to supply most of the roses. When bouquets must be budgeted, long-lasting foliage from other plants can supplement the flowers. Magnolia, rhododendron, podocarpus, holly, eucalyptus, ti leaves or bells of Ireland all make effective backgrounds for flower arrangements.

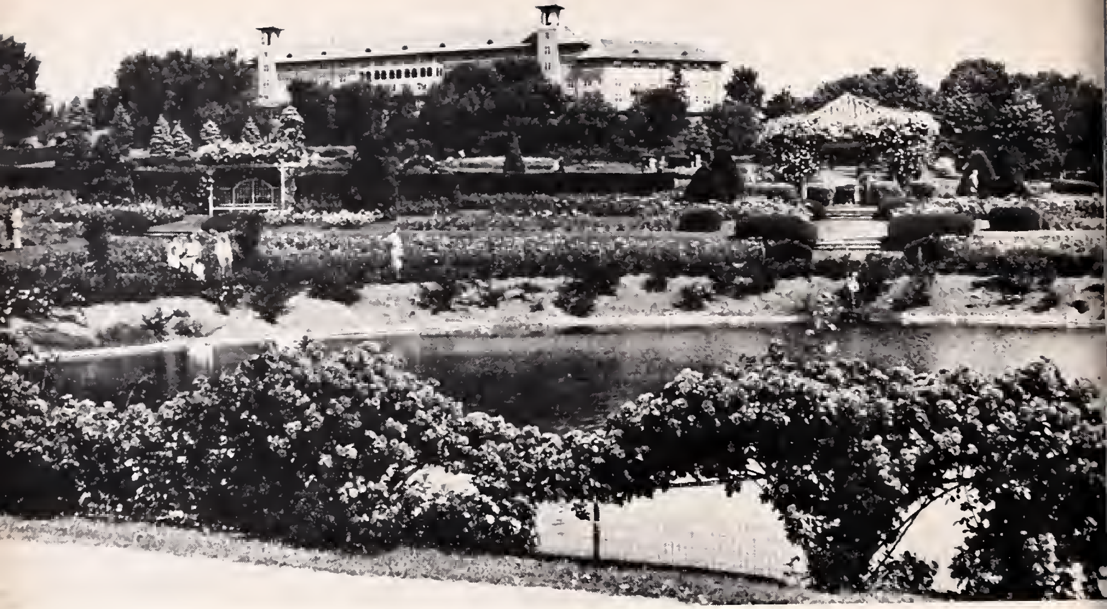
Armstrong Nurseries

Rose arrangement in an entrance hall—a welcoming touch for guests.

Armstrong Nurseries

The selection of florist roses will differ from that of garden roses because greenhouse roses must be varieties that bloom in the low light intensity of shortened winter days. Garden roses that produce most satisfactorily in the intense sunlight of summer do not normally bloom well during the winter months under glass. Breeding and selection are constantly bringing forth new greenhouse roses that last long as cut flowers. 'Christian Dior,' 'Belle Amour', 'White Butterfly', 'Sonora', 'Forever Yours', 'Jacqueline' and 'Eternal Sun' are among recently developed favorites. The popular "sweetheart" (Floribunda) roses 'Garnette', 'Jingles', 'Seventeen', 'Jack Frost' and 'Little Leaguer' also have remarkable keeping quality.

Rose arrangements for the home should not be shackled by the rigid, inflexible rules which often govern flower show exhibits. While an awareness of the underlying fundamentals of floral art is desirable, imagination and originality are also needed when arrangements are being created. ✦



Hershey Gardens, Hershey, Pennsylvania

WHERE TO SEE ROSES

A selected list of public rose gardens

THE following short list represents only a few of the public rose gardens in the United States. Travelers as well as local rose lovers are free to visit them. There are others, too, and no discrimination is to be implied against the many gardens that could not be included in the allotted space. The aim has been to point out gardens in all sections of the country. The figures show the number of plants in each collection. The American Rose Society distributes an annual list that includes private gardens open to its members.

CALIFORNIA
Los Angeles—Exposition Park Rose Garden, 16,000
Oakland—Municipal Rose Garden, 8,000
Whittier—Rose Hills Memorial Park, 4,000

CONNECTICUT
Hartford—Elizabeth Park Rose Garden, 14,000

DISTRICT OF COLUMBIA
Washington—Shoreham Hotel Rose Garden, 1,200

IDAHO
Caldwell—Municipal Rose Garden, 5,500

ILLINOIS
Chicago—Marquette Park Rose Garden, 5,000
Wheaton—Robert R. McCormick Memorial Gardens, 1,000

INDIANA
Fort Wayne—Lakeside Rose Garden, 5,000

IOWA
Davenport—Municipal Rose Garden, 2,800

KANSAS
Topeka—Reinisch Rose Gardens, 9,000

MINNESOTA
Minneapolis—Municipal Rose Garden, 5,000

MISSISSIPPI
Jackson—Municipal Rose Garden, 2,000

MISSOURI
Kansas City—Municipal Rose Garden, 5,000
St. Louis—Missouri Botanical Garden, 5,000

NEBRASKA
Lincoln—Municipal Rose Garden, 1,600

NEW YORK
Brooklyn—Cranford Rose Garden (Brooklyn Botanic Garden), 4,000
Bronx—New York Botanical Garden, 7,000
Rochester—Maplewood Park Rose Garden, 7,200
Tuxedo—Sterling Forest Gardens, 4,000

NORTH CAROLINA
Raleigh—Municipal Rose Garden, 1,600

OKLAHOMA
Tulsa—Municipal Rose Garden, 9,200

OREGON
Portland—International Rose Garden, 10,000

OHIO
Columbus—Park of Roses, 35,000

PENNSYLVANIA
Hershey—Hershey Rose Garden, 42,000
Kennett Square—Longwood Gardens, 1,170

SOUTH CAROLINA
Orangeburg—Edisto Rose Garden, 3,000

TEXAS
Dallas—Dallas Garden Center AARS Garden, 15,000
Tyler—Tyler Rose Park, 38,000

UTAH
Salt Lake City—Municipal Rose Garden, 9,000

VIRGINIA
Arlington—Memorial Rose Garden, 2,500

WASHINGTON
Seattle—Woodland Park Rose Garden, 5,100
Spokane—Rose Hill, Manito Park, 2,500

WEST VIRGINIA
Huntington—Ritter Park Rose Garden, 5,800

WISCONSIN
Hales Corners—Whitnall Park, Boerner Botanical Gardens, 5,000

Exposition Park Rose Garden, Los Angeles, California

International Rose Garden, Portland, Oregon

Park of Roses, Columbus, Ohio

The Cranford Memorial Rose Garden, Brooklyn Botanic Garden, City of New York

The New York Botanical Garden, City of New York

Growing roses in different regions

NORTH, EAST, SOUTH, WEST

NORTHEAST

William L. Homan

Consulting Rosarian, American Rose Society, Editor, The Maine Rose Bowl

THE northeastern corner is generally considered the ice-box of the United States. Natives more or less boast of the brief spring, one day of summer, short fall and long, long winters. In spite of these alleged shortcomings, rose gardens, both public and private, number in the thousands. Many nurseries flourish here, including one in Maine. The coolness of the nights makes color more intense in this area.

Cultural practices differ only slightly from those used elsewhere. The northeasterner must plant roses only in the spring, as soon as the frost leaves the ground. Even though his plants can come from Arizona, Pennsylvania, Oregon or California, they will acclimate themselves and, with winter protection, endure for years. Feeding, watering and pest control are the same as elsewhere, except that no feeding is done after August first.

The job of protecting the plants against the rigors of winter should be completed by mid-November. This involves cutting back the canes on Hybrid Teas, Floribundas and Grandifloras to 14 inches. Soil should then be mounded over and around plants to a height of 12 inches. Conifer boughs may be added *after* mounds have frozen. Generally speaking, climbing roses should not be expected to attain catalog proportions. For the most part they are, at best, 4- to 5-feet shrubs.

Some reports say that 'Sterling Silver', 'Picture', 'New Yorker' and 'Tropicana' will not survive a northern New England winter. Others, from the same area, tell of all four having wintered successfully.

Selected Roses for the Northeast

HYBRID TEAS: Peace, Crimson Glory, Suspense, Charlotte Armstrong, Garden Party, Burnaby, Karl Herbst, Pink Favorite, Sutter's Gold, Nocturne.

FLORIBUNDAS: Vogue, Spartan, Heat Wave, Gold Cup.

GRANDIFLORAS: John S. Armstrong, Mount Shasta, Montezuma, Pink Parfait.

◆

MID-ATLANTIC STATES

Bloys W. Britt

Consulting Rosarian, American Rose Society

THE area from the Blue Ridge Mountains to the sea is blessed with temperate winters, mild showery springs, hot summers and long lazy autumns. The growing season for roses covers almost nine months of the year and only in the higher elevations and in the extreme northern areas of the several Mid-Atlantic states is any winter protection necessary.

Most of the area has a clay-loam soil which needs generous portions of coarse sand or Perlite, peatmoss, compost or other humus materials to make it friable. Once the proper balance is reached, however, and the grower follows the regular feeding, watering and protective care program prescribed, roses respond with a boundless energy that can hardly be matched.

Hot summers make a good program of mulching and watering a vital necessity. Many mulch materials are available for the asking, particularly in "pine country," and in an area where the dairy industry flourishes as part of the economy. By-products of cotton and tobacco growing can be used advantageously not only as a mulch but as a soil ingredient.

The sandy soils of our coastal areas, particularly in Virginia, North and South Carolina and Georgia, need much the same treatment before planting, except that the aim is to increase the moisture-holding capacity of the mixture to offset

Eastern Photo Service

'Ivory Fashion' is a favored Floribunda in the Mid-Atlantic states, also in the Pacific Southwest, the Plains and Rocky Mountains.

the tremendous dehydrating effects of 100-degree summer days.

Selected Roses for the Mid-Atlantic States

Hybrid Teas: Tiffany, Confidence, Eclipse, Peace, Charlotte Armstrong, Chrysler Imperial, Pink Peace, Chicago Peace, Tropicana, Royal Highness.

Grandifloras: Queen Elizabeth, Montezuma, Golden Girl, Carrousel.

Floribundas: Little Darling, Fashion, Spartan, Red Favorite, Ivory Fashion.

◆

FLORIDA

Mrs. G. F. Lampkin

Director, American Rose Society from Deep South District

THE main differences between rose culture in Florida and northern areas is that growth and bloom continue throughout the entire year. Maintenance should therefore also be continuous. Fertilizing is done monthly, sprays for diseases and insects are applied weekly, and water is applied as needed throughout the year.

Growth slows down during the winter months and it is during this season of short days and lower temperatures that light to medium pruning is done. The majority of new plantings are made then.

Soils are predominantly sandy, needing generous additions of humus in whatever form may be economically available locally. A continuous organic mulch is also necessary. It may be of shredded sugar cane, leaves, pine straw, wood shavings or other convenient material.

The average yearly rainfall in Florida is about 50 inches, most of it coming during the summer months. In areas where there is a higher water table during the rainy season, beds must be built up several inches above the surrounding lawn surface.

Commercial fertilizer formulas approximating 6-6-6 or 6-8-8 are applied each month at the rate of one pound per 100 square feet of bed surface for small bushes and two pounds for large ones. During periods of excessive rain, applications may be made a little more often for maximum bloom production. In locations where some frost may be expected, fertilizers are withheld during November and December.

For garden roses in Florida the rootstock preferred by growers of finest quality blooms on vigorous plants with long life is *Rosa fortuniana*. Plants on this rootstock are propagated and grown to marketable size in containers, and may be planted at any time of the year.

Selected Roses for Florida

Hybrid Teas: Christian Dior, Chrysler Imperial, Confidence, Duet, El Capitán, Garden Party, Lady Elgin, Peace, Starfire, Tiffany.

Grandifloras: Montezuma, Queen Elizabeth.

Floribundas: China Doll, Circus, Fire King, Garnette, Little Darling, Orange Triumph, Pinocchio, Rosenelfe, Sarabande, Spartan, The Fairy, White Bouquet. ◆

OHIO AND VICINITY

Harold H. Allen

Director of American Rose Society, Author of "Rose Growing for Exhibiting"

THE large amount of clay throughout the area covered by Ohio and adjacent states makes drainage especially im-

Conard-Pyle

'Chicago Peace' is a popular Hybrid Tea rose in the Mid-Atlantic States, Ohio and the Plains States.

portant. We recommend 3 inches of gravel in the bottom of rose beds with a 3-inch drain tile leading off to a lower outlet. The upper end of the tile (at the rose bed) should be covered with half-inch mesh hardware cloth, then with gravel, so excess moisture can easily drain away.

In this locality, I have obtained most satisfactory results by planting roses 20 inches apart from the center of one plant to the center of another. We prefer bushes with short shanks, about 3 inches long, so the roots will not be buried too deep to get good aeration. We like the bud union to remain at soil level so we plant with the bud union above to allow for settling down to approximately soil level.

We discontinue feeding the last of August to allow hardening preparatory to winter. We bring soil in from flower or vegetable gardens and mound up around each rosebush 10 inches high the last of November for winter protection. Leaves or straw are placed between the mounds. In spring the soil from mounds is taken back from where it originally came. If we use collars we are careful to use those that water will drain through and that are wide enough to give protection.

We cannot winter tree roses standing up. I plant them at the edge of the bed and in late autumn dig a trench out from the bed, loosen the roots opposite the trench and bend the tops and lay them down in the trench and bury them. They winter well this way.

We feed our roses heavily from April 1 to last of August and water each feeding in thoroughly. Beds are watersoaked weekly.

Selected Roses for Ohio and Vicinity

HYBRID TEAS: Crimson Glory, Chrysler Imperial, Oklahoma, Eclipse, Good News, King's Ransom, Granada, Chicago Peace, Pink Favorite, Royal Highness, Tropicana, and Tiffany.

FLORIBUNDAS: Fashion, Fire King, Circus, Sarabande, Saratoga. ◆

MINNESOTA

Carl J. Holst

President, Minnesota State Horticultural Society

ROSE growers in our north country have always faced the problem of winter survival, and because the Minnesota Rose Society has tried out various methods and published these results, rose growing has become more and more popular.

Rose bushes that are vigorous and healthy have the best chance of survival. We water the bushes well during the fall. About the end of October we begin getting ready for winter. The bushes are sprayed with a fungicide and a repellent to discourage mice and rabbits. Next the branches are tied together with string or twine and a wire fence about two feet high is placed around each bed. From this point on there are two successful methods that can be used.

The first method consists of loosening the soil and tipping the bush to the ground. The plant is held down by a heavy, shaped wire, which is forced into the ground. When all the bushes have been tipped, the area is covered with about three feet of leaves.

The second method consists of digging a trench for each bush. This trench is eight inches deep and long enough so that the bush can be tipped into it. Replace the soil to cover the trench and again cover with about two feet of leaves.

About the second week in April the covering can be removed and the roses tipped up and pruned very high. High pruning in this area means earlier bloom and greater total bloom.

Using one of these methods, we are so confident of winter survival here, that some of the members are growing Tea roses successfully.

Selected Roses for Minnesota

Hybrid Teas: Peace, Confidence, Chrysler Imperial, Christian Dior, White Knight, King's Ransom, Tiffany, Helen Traubel, Garden Party, Tropicana, Royal Highness, Charlotte Armstrong.

Floribundas: Red Pinocchio, Saratoga, Fashion, Vogue, Frolic, Circus. ✦

PLAINS STATES

Lester E. Satterlee

Director of American Rose Society

ROSARIANS in the Plains States feel that they have a little harder task of growing roses than those in the rest of the country because of the severe winter cold, the sudden changes in temperature, the hot dry winds and terrific heat in the summer.

Because of the difficult winters, many growers are hilling their roses 8 to 12 inches in the late fall as soon as there has been a good freeze. Planting in fall is practically out; all roses are planted in spring and the pruning is also done at this time. In planting, the bud union needs to be 1 or 2 inches below the top of the ground. This may keep the roses from freezing over winter.

Here on the plains we feel that watering is of the utmost importance, because of our long dry spells. With water becoming scarce, and the water departments of metropolitan areas raising the cost, it is becoming a problem. But there are several good items on the market to help conserve water, such as plastic soil soakers (the ones with pin holes, the holes turned down and water turned on slowly), water bubbler, a sprinkler that waters below the roses, and the watering rod. Roses should receive at least an inch of water once a week or until the soil is wet to a depth of 7 inches.

Conard-Pyle

'Christian Dior', Hybrid Tea, does well for growers from Minnesota to Florida and westward.

To help conserve water, mulching is a necessity, whether it be a dirt mulch (just scratching the top of the soil half an inch to an inch deep) or any good material that is easily obtainable. One of the best, if available, is well-rotted cow manure.

When it is hot and dry we are plagued with red-spider; when it is cool, with blackspot and mildew. Spraying or dusting is therefore very important, a good multi-purpose spray or dust being the best. The roses should be sprayed or dusted every 7 to 10 days or after every rain, otherwise one might just as well leave the material in the cans. The idea is to keep the spray or dust material on the plants to prevent these diseases and insects.

Selected Roses for the Plains States

HYBRID TEAS: Peace, Crimson Glory, Chrysler Imperial, Helen Traubel, Tiffany, Confidence, Memoriam, White Knight, Lowell Thomas, Charlotte Armstrong, Chicago Peace, Christian Dior.

FLORIBUNDAS: Fashion, Spartan, Little Darling, Vogue, Ivory Fashion, Goldilocks. ✦

PACIFIC SOUTHWEST

Fred W. Walters

Past President, American Rose Society

THE limited rainfall of the Pacific Southwestern part of the United States means that we must water or irrigate our roses during most of the growing season and even sometimes in the winter. In fact, because of the mild climate, especially in Southern California, roses will often grow and produce flowers all year.

'Circus', a multicolored Floribunda, pleases gardeners in the Pacific Southwest and Northwest, as well as in such varied climates as Minnesota, Ohio and Florida.

Armstrong Nurseries

Both soil and water are usually on the alkaline side. This means that we must add sulfur or some other agent to bring the pH of our soils to the neutral point or over to the acid side. Our soils lack humus, so we must also add organic matter and always use a mulch. While our general feeding program is basically the same as for other sections of the United States, we should use as much organic types of plant food as possible.

Planting should be done immediately after bare-root plants arrive, which is about January 1. If you use container-grown roses, select plants from cans larger than the 1-gallon size.

Pruning should be light in comparison to pruning in the cold-winter sections of the country. Roots grow better in our milder climate and therefore will support a larger top. In general, not more than about one-third of the rose should be cut off. Mildew is our only fungus problem.

Selected Roses for the Pacific Southwest

HYBRID TEAS: Peace, Chrysler Imperial, Tropicana, Charlotte Armstrong, White Knight, Tiffany, President Herbert Hoover, Helen Traubel, Starfire, Eclipse.

GRANDIFLORAS: Queen Elizabeth, Montezuma.

FLORIBUNDAS: Little Darling, Circus, Ivory Fashion, Frensham, Spartan, Fashion. ✦

ROCKY MOUNTAIN AREA

Marie S. Shields

Consulting Rosarian, American Rose Society

AS the Rocky Mountain states have almost all of the climatic conditions found in the entire United States, the first consideration for a rose grower is the zone in which he lives. Here in the Salt Lake City area, we have a milder winter and less hot summer, so the normal practice is to plant high and to cover only slightly with mulch for both winter and summer. In the mountains nearby, roses must be completely put to bed in the winter and one must expect to plant and prune much later than in the valleys.

In the southern part of Utah, known as Dixie, there is seldom snow or even a freezing temperature. Gardeners therefore follow practices normal to the southern part of the United States. We can find anything in between these two extremes, so garden practices, as well as choice of varieties, are affected by where one lives.

The soils vary from sandy clay to light sandy loam, so it is question of making the heavy soils lighter and the sandy soils heavier to hold moisture and nutrients.

The depth of planting likewise varies with the temperature zone. High planting of the bud is recommended in the warmer sections, deeper planting in the cold zones. People are gradually becoming aware of the fact that this makes a difference, not only in less suckering, but in basal breaks, with more bloom.

Selected Roses for the Rocky Mountain Area

Hybrid Teas: Peace, Tropicana, Eclipse, Chrysler Imperial, President Herbert Hoover, Picture, White Queen, Crimson Glory, Mrs. Sam McGredy, Christopher Stone.

Floribundas: Fashion, Little Darling, Ivory Fashion, Sarabande, Fusilier, Pinkie.

Grandifloras: Queen Elizabeth, Carrousel. ✦

NORTHWEST

R. C. Kalmbach

Consulting Rosarian, American Rose Society, Curator, International Rose Test Garden

In the Pacific Northwest the soil in general is clay loam. Sawdust and barnyard manure mixed in well will put it in good shape for planting roses. Before this is done, however, it is advisable to have the soil tested. The County Agent or the nearest Agricultural Experiment Station is best equipped for this job.

The mild climate makes it possible to plant roses in the fall without danger of damage over winter, if plants are hilled with sand or sawdust. At this season, bare-root roses are best. If, however, planting is delayed past spring, container-grown roses are preferred.

Throughout the growing season, which lasts from February to December, periodic spraying, watering and fertilizing are required. The only serious problem, however, is mildew on the foliage. To eliminate it, most growers use Mildew King, Acti-dione, Phaltan 75 or Pipron.

With good care, roses will remain in bloom from about May 30 until after Thanksgiving. Besides following the All-America selections, a good guide-post for choosing varieties for this region is the City of Portland Gold and Silver Award winners.

Selected Roses for the Northwest

Hybrid Teas: Royal Highness, Camelot, Mister Lincoln, Queen Elizabeth, My Choice, Oklahoma, King's Ransom, Sutter's Gold, Peace, Mount Shasta, Tropicana.

Floribundas: Sarabande, Little Darling, Spartan, Orangeade, Iceberg, Saratoga, Tom-Tom, Rumba, Circus, Folk Song. ✦

Conard-Pyle

'Mister Lincoln', 1965 All-America Rose Selection, is already considered a choice rose in the Pacific Northwest.

WINTER PROTECTION

Everett A. Piester

No phase of gardening is less specific or more controversial than protection of roses to prevent killing-back of the canes or even completely killing the plants by temperatures of 17° or lower. Freezing at low temperatures, and especially repeated freezing, causes the damage by breaking the cell walls. Sun-scald, the burning or drying out of rose canes while the roots and canes are frozen and cannot renew the evaporated moisture, often causes further injury.

Roses of one species or another grow wild from arctic to subtropical areas, and each kind is adapted to its original environment. However, the vigorous roses in present-day gardens that bear large colorful flowers more or less continuously for months are derived from ancestors that came from climates that are free from frost, or nearly so.

Nevertheless, these modern roses can be grown in cold climates, even well into Canada, if given *adequate* shelter. The problem is, what is meant by *adequate?* Local conditions, even within a single community, are as significant as elevation or latitude.

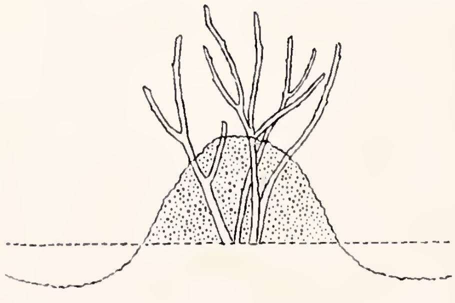
A tree-sheltered area or a sun-warmed house terrace may in part contribute to one's own garden climate. Exceptions are constantly being cited, such as the ten-year-old plant of the Climbing Hybrid Tea 'Dr. J. H. Nicolas' at the northwest corner of my house where it is partly overtopped by a maple tree. Except for small twigs, it has had little winter injury and has to be pruned back at the second story of the house. Meanwhile, in the park garden a mile away, this variety needs full protection.

In general, all modern varieties of bush roses—Hybrid Teas, Floribundas and others—growing in areas where temperatures of 7 degrees or below are expected should have earth hoed up around each plant in a mound at least 8 inches high. This will protect the crown and a few inches of the lower ends of the canes. If that much is saved, a good new top will grow and bloom next year. Some growers prefer to bring soil from elsewhere to build the mounds. If available, compost may advantageously be added to fill the hollows between the plants.

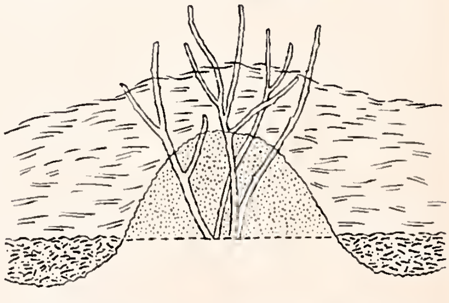
Methods for Cold Climates

To give more protection, if temperatures may drop below zero, leaves may be added to a depth of 10 to 15 inches

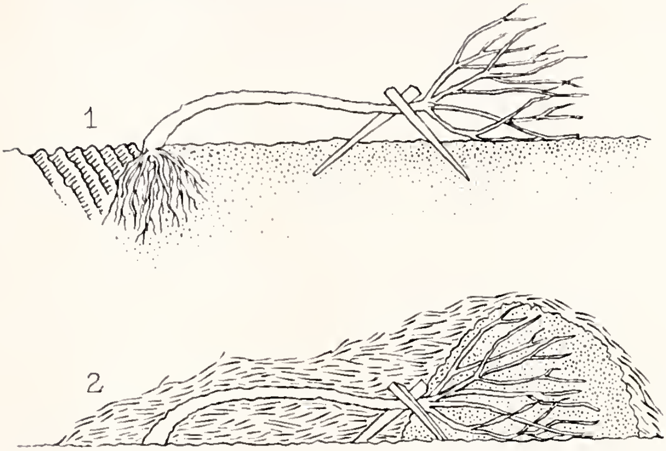
METHODS OF PROTECTION FOR COLD CLIMATES



Cut bedding roses back to a convenient height, then mound soil about the base of each.



Fill depressions beside each bush with manure or compost; mulch with leaves or marsh hay.



One way of protecting a tree rose over winter is to half dig the plant, bend it over, peg it firmly to the ground (1), bury its head inside a mound of soil, and mulch the whole (2).

(they settle to half of that). Among the many ways of keeping the leaves from blowing away are a band of hay or straw around the bed, evergreen boughs or mesh wire.

Except for convenience in working among the plants, it is hardly necessary to prune bush roses in the fall because thorough pruning must be done in spring to remove all the parts that have been winter-killed. These show up as blackened canes.

Several inches of marsh hay may be substituted for leaves. Some growers set up wooden sheds (open at one end) to completely cover each rose bed after mounding and adding the leaves. Snow is a good mulch but its presence cannot be assured throughout the winter.

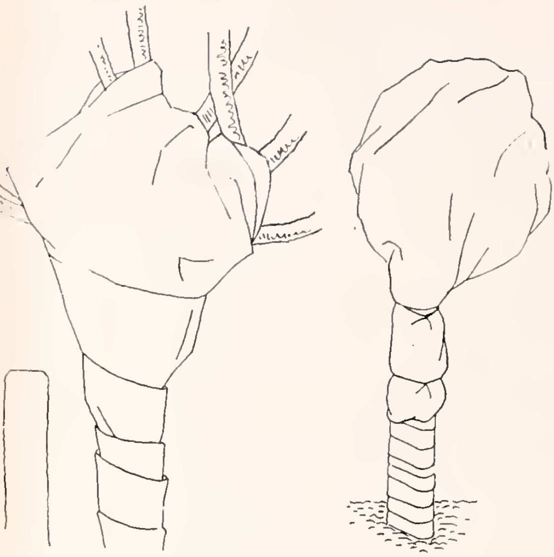
One noted rose consultant and garden designer in the northern states used to insist that each rose bush and climber be loosened or half dug and tipped over so the canes could be laid along the ground and fastened down with strong pegs. Then they were covered with soil, preferably spade-size clods of sod from a pasture, followed by a knee-deep cover of leaves. It was laborious and expensive, but successful even in northern Vermont.

A few modern clones or types such as those originated by Walter D. Brownell are often reported as wintering well in seemingly difficult climates. Experience in the Hartford area indicates that they should have nearly the same cover as other Hybrid Teas.

Several growers winter their roses with great success by pruning the bush plants in the fall to about 7 or 8 inches, almost as close as they would be forced to do in the spring when canes are killed back. Then they set over each plant a demountable, reusable cylinder of roofing paper or quarter-inch mesh hardware wire some 15 inches high and 12 inches in diameter. This is then filled with dry peatmoss, shredded dry leaves, buckwheat hulls or shredded corncobs, and capped with waterproof material such as plastic. Perhaps the best outer cover is a plastic bag, secured quite well, entirely covering the cylinder. Needless to say, such a method of protection is time-consuming, and should be tried only where other methods have failed.

Standard or Tree Roses

Tree or standard roses probably have hardy shanks and roots but the bush at the top is as tender as its named variety, which is sold also in bush form. Often it is sufficient to add one or two strong stakes for support, then prune back the head to not more than 7 inches and en-



If a tree rose is to remain standing over winter in a cold climate, its stem and branches need to be wrapped. A further wrapping can enclose its supporting stake. The head needs protecting with dry leaves inside a hood that is tightly secured to the stem.

close it in a 15-inch hood of crinkled waterproof paper or burlap stuffed with broken straw, marsh hay, peanut hulls, buckwheat hulls or similar dry material. If burlap is used, an inside cover of plastic or other waterproof material is desirable.

A common method is to dig them up and then completely bury the standard roses in a coldframe or in a well-drained area of the garden. A reputedly acceptable procedure is to half dig the tree rose, gently bend it so that the shank is along the ground and the pruned head fitted into a hole prepared for it. Strong stakes are crossed to hold the shank near the ground, then it is mounded over with soil, plus an added cover of leaves or hay.

Older Classes of Roses

Some types or classes of roses, once very popular but seldom planted now, such as Hybrid Perpetuals and Baby Ramblers (Polyanthas), are much more resistant to cold and need less protection. It may be worth while at least to hill them up in locations where below-zero weather may be occasionally expected.

Rugosa hybrids and all of the so-called old-fashioned roses (Damask, Gallica, Moss, Centifolia and others), as well as many species and shrub roses are fully hardy without protection into southern Canada.

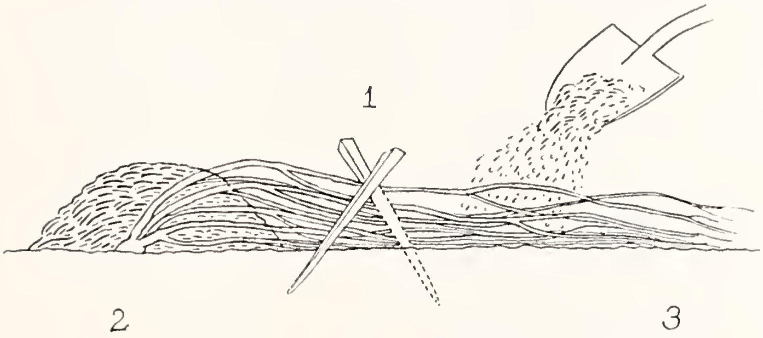
Climbers

I will roughly divide the so-called climbers into two classes. One includes the cluster-flowered, slender-caned ramblers (as 'Dorothy Perkins') and their near associates with larger-flowered clusters, like 'Silver Moon' and 'Dr. W. Van Fleet'. They are quite hardy, although a mound of earth is desirable where near zero is expected. Below that, the canes should be laid on the ground and covered well with marsh hay, evergreens or similar cover.

The second class contains the modern recurrent-flowering varieties. These are mostly large flowered and are tender enough to need hilling up, so that the plant will at least not be completely lost. If possible, the canes of these should also be laid on the ground, pegged down and covered well. If the canes are too large and stiff to lay down, a shelter of evergreens boughs, cornstalks or discarded Christmas trees should be provided on the south side to moderate rapid changes of temperature and prevent sunscald.

Placing and Removing Cover

The time for winterproofing roses is a matter of judgment and location. The point is to get it done just before the soil is frozen. During warm spells in late winter it may be desirable to loosen the covering with a stick or fork to let in some air and prevent moisture damage. As warm days come, open up or lay off part of the cover, keeping it handy to replace if a cold spell comes again. Retain some or all of the earth mound until the weather is quite warm and buds are beginning to start. Never uncover the plants completely at one time.

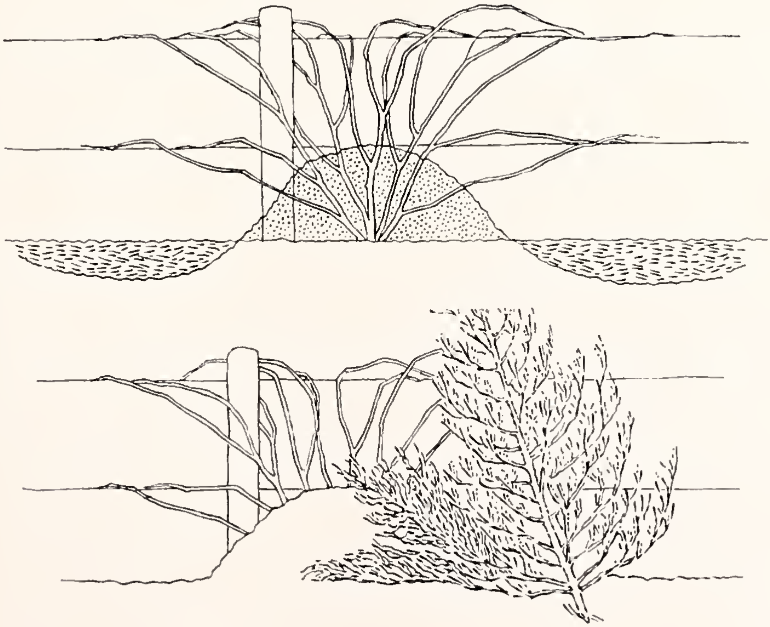


A climbing rose is best removed from its support and pegged to the ground (1) when winter comes. The base is then mulched (2) and the branches covered with hay or soil (3).

Field mice and rabbits may cause some damage by girdling the canes under the mulches. Garden supply stores have specific materials to control these animals.

Whatever the climate or situation, these chores should not be so arduous as to discourage anyone from growing roses. A lady in northern Vermont writes, “I can grow good roses, and I am proud of it.” ◆

Large-flowered Climbers can have soil mounded at the base, the holes filled with compost or leaves. After the ground is frozen, evergreen boughs or discarded Christmas trees will give them further protection.



MILESTONES IN ROSE HISTORY

Herbert C. Swim

Tillotson's Roses

Gallica roses were the dominant type at the Malmaison Garden of the Empress Josephine.

A SPECTACULAR event marked the beginning of the modern rose. The building of the Malmaison Garden of the Empress Josephine near Paris between 1804 and 1814 required such a prodigious effort in the collection of plants and in the construction and maintenance of accommodations for them, that interest was centered on it throughout the civilized world. Many public and private rose collections in Europe and the United States were inspired by the Malmaison roses. The zeal of rosarians was especially notable in western Europe, where France continued to lead, but Great Britain was taking mighty strides.

The first modern cross-breeding of roses is believed to have been achieved by André Dupont, the chief horticulturist at Malmaison. Other French growers were soon engaged in breeding rose varieties (or at least in selecting seedlings from chance pollination). The French dominated the field until about 1850, and have continued to provide leadership, but by that year interest had increased notably in England, Ireland, Germany and Holland. Dynasties of rose-breeder nurserymen were founded, some now in the fourth or fifth generation. By 1900, rose breeders had become active in Denmark, Spain, Italy, the United States, Australia and in some of the eastern European countries.

Tea Roses

The introduction to Europe of 'Old Blush', a variety of *Rosa chinensis,* soon followed by other varieties and hybrids of this species (called China roses or China hybrids), proved to be an important event. So did introduction of the tea-scented *Rose odorata* and its closely related hybrids and varieties (later designated as Tea roses), at about the same time, apparently before the Malmaison Garden was established. At that time they were the only recurrent-blooming roses known to western Europe, but nothing exciting happened until they were brought together in some variety at Malmaison.

Although there is no record of controlled cross-breeding, a great deal occurred by some means, probably through natural agents such as insects and wind. Much seed was planted, seedlings were evaluated, and those of interest were reproduced. Hybrids involving the China roses did not arouse immediate interest, perhaps because most of them had as their other parent the once-blooming French rose (*Rosa gallica*), which dominated Malmaison. The recurrent-blooming trait of the Chinas was genetically recessive to the once-blooming trait of the French rose.

Some historians believe that the Bourbon roses were hybrids of the China and the Damask rose (*Rosa damascena*), both of which are slightly recurrent in their blooming.

Hybrid Perpetuals

Be that as it may, there was great excitement when some of the Bourbon hybrids were backcrossed to China rose varieties and a number of the resulting seedlings occasionally bloomed more than once a year. These were given a new class name, Hybrid Perpetual. "Perpetual" referred to the tendency to recurrent bloom, although this was not at first well fixed.

One of the earliest Bourbon hybrid varieties was 'Gloire des Rosomanes', better known today as 'Ragged Robin'. Introduced in 1825, it was used a century later by California nurseries as a rootstock on which to bud or graft the garden varieties in vogue during the 1920 to 1940 era. It is also the progenitor of many of the Hybrid Perpetual varieties. One of the most famous of the 'Ragged Robin' family is a climbing rose, 'Dr. Huey', today's successor to its ancestor as a rootstock in many California nurseries.

It was principally through the work of two French rose breeders, M. Laffay and J. P. Vibert, that the Hybrid Perpetual class gradually acquired some consistency of character and evolved from a class regarded as upstart to the most popular class of nineteenth-century roses. By about 1900 nearly 1,700 Hybrid Perpetual varieties were available for planting in the famous rose garden, Roseraie de L'Hay in Paris. Many breeders contributed to the list of varieties.

The Hybrid Teas

In 1867 an event occurred that, surprisingly, passed unnoticed at the time, probably because rose breeders were preoccupied with the selection of Hybrid Perpetual varieties. This was the introduction of the first Hybrid Tea variety, 'La France', by its originator, J.-B. Guillot. The new variety had the recurrent-blooming habit of the Tea roses while it retained some traits of its Hybrid Perpetual seed parent, 'Mme. Victor Verdier'. Five years later, William Paul of England produced a new variety from a similar cross and called the resulting plant 'Cheshunt Hybrid'.

The Polyanthas

Three years later, Guillot was responsible for another history-making event. In

Tillotson's Roses

'La France', the world's first Hybrid Tea rose. Its 100th anniversary—1967. The long, bright pink buds, double flowers with a silvery sheen and intense fragrance have kept it in demand for a century.

1875, he introduced the first Polyantha variety, which he called 'Pâquerette'. Its apparent seed parent was a plant of *Rosa multiflora* brought from Asia by the British plant explorer Robert Fortune, and presented to the Mayor of Lyons, France. Because of the dwarf size of 'Pâquerette' it is surmised that its probable pollen parent was a form of the original Miniature, *Rosa chinensis minima.* 'Pâquerette' soon became the progenitor of many dwarf, cluster-flowered varieties that were also recurrent in bloom. After much controversy, the name Polyantha was given to the group, which is now recognized as a horticultural class. Today 'Pâquerette' and those of its family of similar growth are commonly called Dwarf Polyanthas, to distinguish them from members of the class sometimes referred to as Hybrid Polyantha, which is characterized by taller growth and larger flowers.

In 1924 the two classes originated by Guillot were crossed by Svend Poulsen of Denmark to create the Hybrid Polyantha class, now called Floribunda. Poulsen crossed the Polyantha 'Orléans Rose' with the Hybrid Tea 'Red Star' to obtain 'Else Poulsen'. This new intermediate class added enough plant hardiness and flower size to be significant. Eugene S. Boerner of the United States, beginning about 1940 and continuing to the present time, has been the most prolific

Morse

'Else Poulsen', the first Hybrid Polyantha, was created in 1924 when a Polyantha rose was crossed with a Hybrid Tea.

breeder of this useful class. His world-famous varieties such as 'Fashion', 'Vogue', 'Ma Perkins', 'Spartan' and a host of others have added beauty to the rose gardens of the world.

Rose Society

In 1876, four years after the second Hybrid Tea was introduced in England, the National Rose Society of Great Britain was founded. Today, with more than 100,000 members, it is by far the largest rose society in the world. Its influence on rose breeding, rose gardening, rose shows, and general promotion of interest in roses —not only in Great Britain but all over the world—cannot be minimized. As might be expected, some of this enthusiasm has been expended in controversy, sometimes intense and always effective. Members have provided much of the discussion in opposition to new class names, notably the terms "Hybrid Tea" and "Floribunda," which they eventually accepted. They have not yet accepted "Grandiflora." Controversy over these names, of course, ably publicized the new roses.

New Hybrid Teas

Breeders from the start must have seen in the new Hybrid Tea class a hint of things to come, for they continued to add new Hybrid Tea varieties. Although they were not all vastly popular in themselves, such varieties as 'Lady Mary Fitzwilliam' in 1882, 'Mme. Caroline Testout' in 1890, 'Mrs. W. J. Grant' in 1895, 'Liberty' in 1900, and 'Radiance' in 1908, proved to be outstanding as parents of later worthwhile varieties.

With their offspring they set the stage for an era which was triggered by the introduction in 1900 of 'Soleil d'Or' by that great French rose breeder, Joseph Pernet-Ducher. The violet-red Hybrid Perpetual 'Antoine Ducher', crossed with the bright yellow *Rosa foetida persiana,* produced 'Soleil d'Or', which in turn was crossed to Hybrid Teas. This led to inbreeding resulting in a riotous assortment of roses whose colors ranged from bright yellow, orange, and copper to bicolors, and exciting blends with the pinks, modest reds, and creams already known in the Hybrid Teas. The pinks were more vivid, the reds were more free of blue and more brilliant, and the color combinations were seemingly endless.

European breeders of the 1920's and 1930's did much inbreeding and were occasionally oblivious of the serious plant deficiencies that were involved in the exciting new colors of these so-called "Pernetianas." Some rosarians have criticized the breeders of this era—even the great Pernet-Ducher himself—seeing only the negative results of the constant inbreeding, such as the introduction of disease susceptibility (particularly to blackspot) and lack of vigor. We prefer to see the positive aspects, especially the stimulus to the emotions and imagination. The errors of selection (if they were errors) tend to be self-correcting, calling attention to a need for improvement which will come in due time.

An important occurrence in 1930 ushered in an era of rapid change and kaleidoscopic events. The United States Congress passed a bill amending the Patent Act to include plants, and President Hoover signed it into law.

All-America Rose Selections

Encouraged by the new protection, systematic rose breeding was initiated at a number of rose nurseries in the United States. So many varieties were introduced that it soon became apparent that pre-introduction screening was needed. To achieve this, a number of leading growers organized in 1938 to set up a garden-test program, calling it All-America Rose Selections, Incorporated. This was the first such testing anywhere in the world. The organization, now 25 years old, serves both the general public and the trade.

Morse

'Queen Elizabeth' was the first rose of the new class called Grandiflora. Tall, erect stems and clustered flowers are among its characteristics.

Morse

'Charlotte Armstrong', introduced in 1941, set a new standard for bud and flower form. It has since been the parent of numerous award winners.

When W. E. Lammerts produced 'Charlotte Armstrong' in 1941, a new plateau was reached in the Hybrid Tea class. One of the earliest recipients of the All-America Rose Selections award, this great rose set a new standard for both bud form and flower form. In spite of its "Pernetiana" heritage it was notably healthy and disease-resistant. 'Charlotte Armstrong' has been a parent of one great award-winning variety after another. In 'Chrysler Imperial' and 'Queen Elizabeth' Lammerts produced from it two epoch-making varieties, both All-America Award winners in their own right, and already parents of other All-America Award winners. Two startling red roses have been bred from 'Chrysler Imperial' by Swim and Weeks. One of them, 'Mister Lincoln', is the AARS Hybrid Tea winner for 1965, and the other, 'Oklahoma', the Gold Medal winner of the 1963 Japan Rose Festival.

Conard-Pyle

'Camelot', a Grandiflora rose, is a 1965 All-America Rose Selection. It was produced by crossing 'Queen Elizabeth' with 'Circus'.

'Queen Elizabeth' is the first representative of a new class named "Grandiflora." This class, created by All-America Rose Selections and approved by the American Rose Society, is intended to accommodate not only 'Queen Elizabeth' but its foreseen successor-companions and offspring of similarly tall, often clustering, erect habit. Most of the representative varieties of this new class are related either to 'Queen Elizabeth' as offspring or through some of its siblings from the cross of 'Charlotte Armstrong' with 'Floradora'. This type of cross has also produced such varieties as 'Roundelay', 'El Capitán', 'Starfire' and 'Montezuma'. 'Queen Elizabeth', when crossed to 'Circus' by Swim and Weeks, produced 'Camelot', another Grandiflora and also winner of a 1965 AARS award.

Like all of the new class names before it, "Grandiflora" is controversial. Discussion of such designations together with time and perspective, tests the value of each new term.

The spectacular Hybrid Tea variety 'Peace' is a monument to its originator, the late Francis Meilland of France, who, in the minds of many rosarians, was in the tradition of genius built for France by such rose breeders as Laffay, Vibert, Guillot, and Pernet-Ducher. 'Peace' was released for distribution in the United States just after World War II. Its extraordinary combination of superbly developed traits — very large flowers, novel coloring, large petals, glossy, somewhat rugose leaves, and strong stems on a vigorous plant with greater than average health—set 'Peace' apart as a landmark. Its contribution to the future remains to be determined, but it is already the parent or ancestor of many fine new varieties.

The pace of development in the rose for the past 150 years has been accelerating right up to the present moment. ◆

Morse

'Peace', a magnificent Hybrid Tea, outstanding for its flowers, foliage, stems and vigorous growth. It is the progenitor of many fine varieties.

ALL-AMERICA ROSE SELECTIONS

WHEN a rose carries the designation "AARS award," it means that it has been tested for two seasons in different parts of the country by qualified judges and, as a result of its success in various situations of climate and soil, has been selected as an outstanding new rose of the season.

All-America Rose Selections (AARS) is a combination of about 25 rose hybridizers and nurseries which was organized in 1938 to test new roses submitted each year and to make awards to the outstanding new roses of the year. There is no requirement to give an award if there is no rose that measures up to award quality. Rules prohibit giving more than five awards in any one year.

The organization has 25 test gardens distributed over the U.S.A. Four plants of each bush variety and two plants of each climbing variety must be furnished to each test garden. Each garden is under the direction of an official judge who scores each variety that is entered several times each season for two years on a point system for 12 qualities of plant and bloom. Some of these judges are members of AARS, while others are connected with public rose gardens or with Agricultural Experiment Stations. No judge is allowed to report a score on his own entry.

Twice each season, the scores are turned in to the secretary, who tabulates and averages them. At the end of the two-year trial, scores are reported to the meeting of the members with comments from each judge. The members then determine the awards to be given. Plants of the roses which receive awards go on sale to the public two years later.

In recent years, from 40 to 70 new rose varieties have been submitted for the trials each year. Of these, two to four have been selected for awards.

Entries are not limited to members. Anyone with a new rose variety can enter it for a reasonable fee and by furnishing plants for the trials and providing propagating material for the rapid production of plants to be offered for sale if the variety receives an award.

THE AMERICAN ROSE SOCIETY

AMATEUR gardeners from every state and many foreign countries make up the majority of the 17,000 members of the American Rose Society, which is the largest national horticultural society in the United States.

To correlate the interests and activities of the members, who are affiliated in 360 local chapters, there are 18 district organizations, each with a Director in charge. Further, 15 national committees function through the national office, all in the interest of serving individual members and their local groups. Some are concerned with the training and accrediting of judges for rose shows, some with standards for prizes and awards, others with programing services, and so on. Two national meetings are held for members each year.

Publications of the Society include the monthly *American Rose Magazine,* the *American Rose Annual*—an illustrated yearbook, a booklet entitled "Guide for Beginners on Growing Roses," a folder, "Guide for Buying Roses," published annually, an up-to-date list of public and private gardens that may be visited, and a list of books available for loan.

The publications mentioned are among the benefits of membership, which is $7.50 a year. The address is 4048 Roselea Place, Columbus, Ohio, 43214.

KEEPING ROSES FREE FROM PESTS AND DISEASES

Cynthia Westcott

PEST control is important in growing roses but it need not be arduous or time-consuming. For twenty-five years I earned my living spraying roses, along with other plants, in home gardens. With one assistant, I treated more than fifty gardens every week; this meant less than an hour's work in each garden. Now that I have retired, I spray my own three hundred roses without help in less than an hour a week.

Prevention of damage is more important than cure. Many pests can be kept out of the rose garden by spraying or dusting the plants with chemicals every week or two during the growing season. Begin this treatment in the spring when new growth is 4 to 6 inches long.

Although there are hundreds of possible rose troubles, most of them can be safely ignored. The few discussed here are important enough to call for control measures in most sections of the country.

Applying the Chemicals

It is seldom necessary to apply insecticides, fungicides, or miticides separately. There are hundreds of different combinations on the market and you should be able to find one tailored for your personal problems. A multi-purpose spray should contain one or two fungicides (such as folpet or maneb, chiefly for blackspot and mildew), one or two insecticides (such as malathion or Sevin, for sucking and chewing insects), and a miticide (such as Aramite, Kelthane or Tedion). Sprays are somewhat more effective than dusts and can be easily applied with a hose-end sprayer. You should choose the type (such as the Hayes 6 Spray Gun or the Ortho Queen-Size Sprayette) that has an extension tube and deflector so that you can spray from the ground up through the plant. Compressed-air, knapsack, wheelbarrow and power sprayers are also satisfactory but usually involve more work. Have a nozzle that gives a fine mist and use as little chemical as possible for thorough application.

Always spray *before* it rains because infection occurs during the wet period. You do not have to repeat right after the rain because with a once-a-week schedule you will always have a protective coating on the foliage. Modern pesticides are formulated to stick; they may weather, but they are not washed off immediately. Do not add a sticker-spreader to the spray unless instructions call for it. Some additives increase spray injury; some decrease efficiency. Never use a stronger spray than is recommended on the label. In hot weather you may have to decrease the normal dosage.

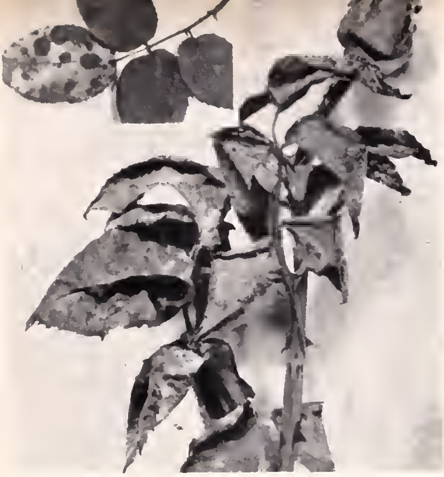
To save time and energy, add a foliar food, such as Rapid-Gro, to the pesticide combination. This way you can feed your roses while you spray them.

Dusting is somewhat less effective than spraying, but some people prefer it. A small aluminum rotary duster is easy to operate and gives good coverage. Be sure to buy the extra extension tube that enables you to reach the under-leaf surfaces.

Summer pest control is the best winter protection a rose bush can have. If the original leaves have stayed on the plant and have manufactured enough food to stock the canes well with carbohydrates, the rose will, in most areas, winter without an earth mound or other protection. If the bush has been defoliated by disease or mites two or three times during the summer, it has lost so much vigor it is likely to die even if winter covering is provided.

Rose Diseases

You may never need to identify a particular disease or insect if you use a multi-



Mildew on rose foliage and bud. ***Inset:*** **Blackspot on rose leaf.**

purpose spray regularly, but you may wish at some time to identify a particular cause of injury. The most important rose diseases and insects are described below with recommendations for the control of each of these for your guidance should you encounter special problems.

Rose blackspot is known to occur in every state except Arizona, Nevada and Wyoming but it is less serious in the semiarid Southwest. In regions with normal rainfall it is a primary cause of defoliation, subsequent loss of vigor and sometimes death of the bush. The fungus pathogen winters in old leaves on the ground and (more important) in small, inconspicuous dark lesions on canes. Spring infection comes from spores which are produced in these lesions and spread by rain or spray from a hose. Black spots with fringed margins appear on leaves a few days after inoculation, and these produce secondary spores that are washed to nearby bushes. In very susceptible varieties, the leaves turn yellow and soon drop; in tolerant varieties they may remain green and stay on the bush even when spotted, but they are unsightly.

Care in watering reduces the incidence of blackspot. Use a waterwand or a soil-soaker hose or, if you must wet the foliage with an overhead sprinkler, do it early in the day so that the bush will dry off before night. Six hours of continuous moisture are necessary for infection.

Protectant spraying should start soon after roses come into full leaf and continue more or less weekly until hard frost. Folpet (Phaltan) is perhaps the most effective chemical but maneb (sold as Manzate or Dithane M-22) is sometimes preferred in the South. Other recommendations include captan, ferbam, copper, and sulfur.

Leaf diseases that are occasionally important include **Cercospora leaf spot,** which appears as small light brown areas with dark borders, and **spot anthracnose,** which has white centers and dark red margins. Maneb is quite effective for Cercospora leaf spot. Any spray for blackspot should reduce spot anthracnose.

Powdery mildew ranks next to blackspot as a rose problem, and is usually more important on the Pacific Coast. Mildew starts on young leaves in slightly raised reddish blisters covered with a white weft, and goes on to cover leaves, flower buds, and sometimes canes with a white felty tangle of fungus threads bearing chains of powdery spores. These are spread by wind. Mildew is more abundant in locations with little air circulation. Warm days followed by cool nights encourage it in late summer. Buds and flowers are often deformed when they are most wanted for flower shows, but bushes are seldom killed by mildew.

Acti-dione PM is an antibiotic prepared specifically for powdery mildew. Karathane (Mildex) is also effective but may be slightly injurious if too high a dosage is used in hot weather. Phaltan reduces mildew but may not control serious outbreaks. Copper oleate is successful in some instances and the new Pipron is promising.

Rose rust has been considered chiefly a problem of the Southwest and the Pacific Coast but it occasionally shows up in southern and eastern gardens. Pustules of powdery reddish-orange spores appear on the lower surface of leaves; light yellow spots develop in the same areas on the upper surface. Leaves may wilt and drop. New generations of summer spores may be produced every two weeks, and in autumn black winter spores are produced in the same pustules.

Sulfur dust is an old remedy for rust; zineb and maneb are more recently recommended. Removing and destroying all old rusted leaves during spring pruning aids in control.

Crown gall is a bacterial disease which causes roundish, rough-surfaced galls near the crown of the plant or on its roots. The disease is unpredictable; some infected bushes die within a year or two of planting, while others survive. If a diseased plant is removed, the bacteria may live on in the soil and infect a new healthy bush, or the new bush may escape infection. It never pays to take a chance. Refuse to plant any rose with large bumps that might be crown gall. Ask your nurseryman for a replacement. Since there is no practical treatment after planting, the best remedy is exclusion.

Common canker, a frequently observed disease of rose canes, is a lesion in the woody tissue. It is caused by a weak parasitic fungus that enters through wounds or dying tissue. Stubs left in pruning provide easy access for this pathogen, which produces dark sooty areas near the stub or near thorn or frost scars. Always cut a cane just above a bud or leaf, never halfway between nodes. After frost injury, cut back to sound wood.

Brown canker comes from a truly parasitic fungus which can penetrate healthy canes. Very small purplish spots appear which turn white in the center and have reddish purple margins. Several may grow together to form a large lesion. Under a moist winter covering the cankers may ultimately girdle the cane and produce yellow spore tendrils in spring. The best control is to keep canes as dry as possible over winter, avoiding a moist mulch and, where climate permits, eliminating all winter protection. Seriously infected canes should be removed and burned at spring pruning. Spraying for blackspot during the summer should keep brown canker at a minimum.

Nematodes are tiny, often microscopic, animal pests but their effect is considered a disease. Many of them are associated with roses. Some cause the familiar root knots, but most cause a sloughing off of roots and consequent stunting of the bush. Nematocides such as Nemagon or V-C-13 can be used around living plants but their efficacy depends somewhat on the type of soil. Ask your State Agricultural Experiment Station for help in diagnosis and control.

Chemical injury may simulate disease in roses. Sprays that are too strong can cause defoliation as severe as that due to blackspot. When weedkillers containing 2,4-D are applied anywhere near rose bushes, the foliage may become small and twisted or otherwise deformed.

Insect Pests

Pith borers are best eliminated by cutting canes below the infested portion during spring pruning. The most common borers are larvae of the small carpenter bee, which are often found lined up in the pith. Many gardeners paint pruning cuts to prevent egg-laying. I have never found this necessary and have noted that some paints injure the canes. I merely clean up in the spring and then watch through the summer for wilting canes or canes which show sawdust. These I cut out.

Rose scale is sometimes noted during pruning. Round, dirty white shells appear on canes, usually near the base. Heavily infested canes should be cut out, and the rest should be sprayed with dormant-strength lime-sulfur (1 part liquid concentrate to 9 parts water). Oil sprays are less effective.

Aphids go into action when the first leaf buds unfold, clustering on young shoots and later on flower buds, which they often deform. A dozen or more species infect roses but the most common are the pink and green potato aphid, which moves over to potato and similar crops in summer, and the rose aphid, also pink and green, which stays on roses.

Any contact insecticide will control

aphids. The list includes nicotine sulfate, long familiar to gardeners as Black Leaf 40, pyrethrum, rotenone, malathion, lindane, and systemics such as dimethoate; all are effective if applied in time. Lady beetles are also helpful and I usually leave some climbing and shrub roses unsprayed as a haven for them.

Leafhoppers may be a nuisance in spring and fall. They are small, wedge-shaped insects that feed from the lower side of leaves and hop away quickly when disturbed. Their sucking produces a stippled white pattern on the upper surface of foliage that can be quite disfiguring. DDT is an effective control; some of the systemic insecticides are useful.

Rose slugs are active in early spring and some reappear in autumn. They resemble minute slugs but are actually larvae of sawflies, which resemble houseflies except for having four wings. The larvae skeletonize leaves, eating out everything but the epidermis. Spray early with lead arsenate, DDT, methoxychlor, Sevin, malathion or rotenone.

Budworms and other caterpillars may eat into flower buds in late spring. Some also roll leaves and tie them together. Cut out the infested buds and spray with Sevin, DDT, or lead arsenate.

Thrips are more of a menace to the first flush of rose bloom than to later flowers. They are very minute, slender, bristle-winged insects that fly daily from flowering grasses and trees to roses, causing buds to ball or to open part way with the petals showning brown edges. Control is difficult, but systemic insecticides such as dimenthoate (Cygon) are helpful. Lindane and dieldrin sprays have been recommended.

Beetle, to an eastern rosarian, usually means the Japanese beetle, but there are others. The **rose chafer** (often called rose bug) is a tan, long-legged insect that feeds on first blooms, often coming over from peonies. It disappears about the time the first **Japanese beetle** emerges from the ground (late June in the suburban New York area). This metallic green-and-copper, oval beetle ravenously devours flowers and foliage for six to eight weeks, gradually diminishing in late summer. In midsummer, greenish, black-spotted **cucumber beetles** may be conspicuous on flowers, but they are not a serious problem. The **rose curculio,** red with a black snout, drills into rose buds but is more common in the central states than in eastern gardens.

Sevin is especially recommended for beetle control. DDT, methoxychlor, and lead arsenate are also effective.

Rose midge is an occasional pest, but when it appears the results are devastating. The flower buds turn black or become twisted and drooping. An infested garden may be entirely without bloom by late summer. The maggots inside the buds and the midge flies or gnats are almost too small to be seen. DDT applied to the entire bush and to the ground (three applications 10 to 14 days apart) will control the midge and allow a new crop of perfect flowers to develop.

The **leaf-cutter bee,** known for the perfect ovals and circles it cuts out of rose leaves in summer, is essentially beneficial as a pollinator. It merely uses the leaf bits to line and cap its nests so we do not try to poison it.

In my opinion, **spider mites** (red-spiders) are the most serious rose problem after blackspot. They are not true insects, having four pairs of legs rather than three at maturity. They winter in weeds and gradually increase in number as the weather warms up. They are very tiny and they run up and down cobwebs on the lower side of leaves, dropping tiny dark bits of excrement. The foliage turns gray, yellow, or reddish and often drops. Aramite, Kelthane, and Tedion are most often used for garden roses. Some of the broad-spectrum insecticides, such as DDT or Sevin, may increase mites by killing their parasites and predators, so add a miticide if you use such a spray. Forestall major trouble by cleaning up weeds in autumn so that the mites are deprived of winter shelter.

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"Bootstrap" educational program by and for prisoners has resulted in this rose garden of 3,500 plants.

ROSES AND REHABILITATION

John F. Hoffman and Charles E. Ervin

WHEN John Doe was paroled from prison a few years ago, a job in nursery sales was waiting for him. The employer had been so impressed with his managerial ability while supervising other prisoners in developing a rose garden, that he held the position open until the man could be released.

The rose garden, probably the largest in the State of Michigan, was planted in the heart of the world's largest walled prison. It was created as part of the institution's Academic School, called "Operation Bootstrap." Initiated by inmates, this aimed at giving men a start on the road to rehabilitation through education and productive volunteer work.

Origin of Bootstrap

The project was initiated in 1961 when this one particularly resourceful inmate suggested that a class in landscape gardening and design be started, and he volunteered to teach it. He had had some landscape sales experience and felt that a number of other inmates might find the training helpful upon release.

Activity began in the night school pro-

Gardens, and especially roses, have been used under a wide variety of conditions for their therapeutic and rehabilitation value. Excellent results of therapeutic nature are reported, for example, from the Veteran's Hospital, Perry Point, Maryland. The experience described here in "rehabilitation through education"—and through absorbing work—at the State Prison of Southern Michigan is outstanding.—The Editors.

gram as a special-interest class, with pencils, graph paper designed and printed in the print shop, and a few free pamphlets from state agencies the only tools. No funds were available in the budget for drafting equipment and textbooks—a typical situation. The instructor asked, and obtained, permission to take his problem to the business and manufacturing world.

The Garden Idea Develops

An appeal was accordingly sent to selected firms and industries, followed by the *Bootstrap Newsletter,* which acquainted outsiders with the problems, objectives, and progress of the program. "Rehabilitation through Education" became the slogan, and interest and aid were soon forthcoming. The instructor and students wangled a two-and-a-half acre plot for practice landscaping and decided to create a formal rose garden. Nurseries and garden supply outlets were notified of the plan, and their quick response started the garden on its way.

Intersecting graveled paths were to divide the garden area into four parts, each designed to contain a combination of ten round and square beds. Following their own blueprint, the Bootstrappers laid out the paths and beds, prepared the soil, and planted the first thousand roses with March snow whirling around them. By June the formal garden and the supply beds held about three hundred varieties of Tree roses, Hybrid Teas, Hybrid Perpetuals, Floribundas, Grandifloras, Miniatures, Shrub, and Polyantha roses—an estimated total of 3,500 sturdy plants.

Motivation of Workers

This sketch makes the project sound easy, but the opposite was true. The work was entirely voluntary and it had to be done in the little time available to the men after their regular jobs and classes. Many gave up their week-end and evening free time to work with the roses. Not one was a gardener. Most were unaccustomed to the heavy labor involved, and were not adequately clothed or equipped for the work. Some were of the type regarded as almost unemployable elsewhere in the institution because of attitude or physical or mental health. For many of these men, a cooperative effort of this type seemed almost impossible.

In general, the motivation and interest of the men were high. This was partly because they themselves had planned, designed and planted the garden. They found themselves absorbed in a project totally foreign to them and doing menial work such as they had never done before. Their industry caused raised eyebrows among prison counselors who had catalogued many of them as chronic shirkers.

When the garden was fully planted and the work became routine, many of the workers lost their interest in it and turned to other activities. Some men who were unable to cooperate successfully with others either asked to be dropped from the program or tended to find jobs they could do in the garden with a single friend or in a section where they could work alone. Following the pattern of voluntary groups everywhere, a core of dedicated men did most of the work.

Not long after the garden was well established, the man who had taught the landscape class and had been the leader in Operation Bootstrap left on parole. On the basis of the job he had done in the prison, he obtained work in a Western Michigan nursery sales establishment. The present inmate-coordinator has now had the job for three years. It is a job of great variety and responsibility, seeming to require a twenty-four-hour day. Involved as he is in long hours devoted to garden maintenance, work organization, Newsletter publishing, and voluminous correspondence, the coordinator cannot fail to develop the ability to express himself, to work with others, and to learn much of value about gardening and public relations.

In addition to the first coordinator, several of the gardeners have received outside employment as result of their participation on the garden program. Some went directly into nursery work, while others were placed in various jobs arranged for them by Bootstrap friends in the business world. A local university horticulturist believes that opportunities for men in grounds maintenance and landscaping jobs are increasing. If this is true, the gardening aspects of this program continue to hold promise for some of the men who acquire gardening experience here.

How Other Inmates Feel About Bootstrap

The interest of inmates other than those directly involved in the rose garden and landscaping class is difficult to determine, but it is reasonable to assume that they are influenced by the beauty of the garden, if nothing else. The interior of the prison is divided by a corridor of buildings which house the school, among other facilities. In the north-yard half, the rose garden is flanked by the disciplinary block, but paved walks which the inmates use constantly line the other sides. The men in the south-yard half pass by one side of the garden every time they go to the mess-hall or outdoor-recreation area. Thus the prisoners have many opportunities to see the roses.

A variety of comments and observations have been made about the garden by these men. They range from unwarranted criticism to great appreciation. Many want flowers to take to their cells or to their work stations, and in several of the blocks other men have planted gardens outside their cells. Men working for the chaplains set out plants along the chapel walk. Since favorable comment far outweighs adverse, it is safe to say that the garden represents for most of our men an island of beauty in the midst of drabness.

The first roses being set in the ground in 1961. Three hundred varieties were planted.

Interest Outside

The views of outside people tended at first to parallel those of the inmates. A few employes of the prison took a dim view of the project, while others regarded the garden merely as a source of flowers. However, the rose garden soon was accepted and appreciated by most of the prison staff.

Many people have wished to visit the garden, but because of strict limitations on women visitors, some groups could not come inside. However, men from all over the United States, Canada, Mexico, and several European and Asian countries have toured the garden. Michigan park superintendents come by frequently and occasionally the warden has made special arrangements to permit all the women workers outside the security walls to see it. A subsidiary garden now in front of the administration building should provide an unrestricted display of the inmates' horticultural skill.

People outside the prison have played important roles in this program. Company representatives have called to find out what supplies were needed for the garden and have talked to the men in their classes and at work. Representatives of clubs and other organizations have lectured and demonstrated in the classroom. A Detroit florist gave lessons in flower arrangements. Expert guidance, including diagnoses of soil and plant conditions, has come from members of Michigan State University's departments of horticulture, entomology and landscaping-design. In short, whenever people outside have found that these men behind walls are serious in a self-help effort they have been eager to aid.

The *Bootstrap Newsletter* goes to about 750 outside friends each month, but the actual number of well-wishers is in the thousands. Each year the Jackson Rose Festival Committee reserves a display booth for roses and art work from the school. The Michigan Horticulture Society has been interested in the garden from the beginning and in 1962 gave it one of its annual awards. Michigan newspapers have given the garden excellent publicity, and several important magazines have carried stories about it.

Rehabilitative and Therapeutic Potential

People often ask us about the rehabilitative or therapeutic value of gardening. Experience at the State Prison shows that some men can profit by it very much. In simplest terms it might amount to nothing greater than giving certain men a way of "doing time" in a constructive way. There are some whose handicaps of body, mind and attitude can be compensated or modified if their activities keep them out of trouble, make them feel useful, and help them gain the experience of worth-while accomplishment. Anything that improves a man's self-image is a start in the right direction.

Some of the long-termers take to gardening very seriously. One man worked nights on his regular assigned job, but as soon as he could get into the garden he would be there. For a time, his one-hundred-pound stooped frame moved about the garden all day long. He did the hardest and most unpleasant work. Occasionally petty jealousies among the workers flare into sharp verbal exchanges; arguments develop over what is or is not the proper way to feed, spray, or prune. A few times leadership rivalries split the workers into opposing camps. This man, rather than become involved, would work by himself until things settled down. Finally he asked approval to take over the entire maintenance of the 1,000 plant supply bed. Before getting into garden work, he had a history of disciplinary and mental difficulties. During his four years in the garden he has had a clean record with custody, and his former frequent visits to the psychiatric clinic decreased to only one of consequence during this time. "I can go in there from my job," he said, "mind my own business, and stay out of trouble. I never know what happens to the time."

Here sturdy rose bushes reflect the interest of prisoners in developing practical new skills.

Another, considerably younger, did well during the past year when he was assigned to work in the garden full time. Through spring, summer, and fall he carried a major portion of the garden burden. About mid-winter he took his life. He had threatened to do this before he worked in the garden. Perhaps the garden sustained him as long as he could be active in it, and during the layoff his personal problems caught up with him again. Gardening is not a cure-all, but it certainly has a place in therapy and rehabilitation.

Many institutions now have gardening programs, and many others could profit from them. Horticultural courses, practical courses in landscaping, and gardening programs have been highly developed in Florida prisons. Further exploration of their value in therapy and rehabilitation is needed. Meanwhile, the promise of jobs for the men upon release should encourage institutional staffs to try gardening as a tool to help prisoners help themselves. ✦

HOW TO HYBRIDIZE ROSES

Ernest W. Schwartz

PRODUCING a new rose by hybridizing is not difficult. All that is needed, substantially, is to gather some of the powdery pollen from the little yellow-headed stamens just inside the petals of a flower and place it directly on the sticky little disks in the center of another flower. The main requirements (aside from roses to work on) are a creative urge, considerable time, and reasonable patience.

The procedure, however, may hold greater interest for the hybridizer if he understands what it going on. The first step is to remove all the petals from a partially open flower.

Structure of a Rose

The stamens, which are encircled by the petals, bear the pollen, which is the male element of the flower. Each consists of a threadlike stalk, or filament, topped by an anther in which the pollen is produced.

In the very center is the female element of the flower, made evident by numerous small disks on stalks. These disks, called "stigmas," receive the pollen. The stalk (called the "style") connects each stigma to a small swollen body below. This is an ovary, and each one contains a single ovule.

When a pollen grain alights (or is placed) on a stigma, it sends a tube through the style to the ovule in the ovary. Fertilization follows, and the ovary develops into a small, hard, one-seeded fruit. Many of these fruits (often miscalled seeds) are contained in the expanded, succulent, usually red base of the flower. This is known as the "hip."

When pollen has come from a different kind of rose, the resulting seeds will carry some of the traits of each parent. Plants that are grown from these seeds will be hybrids. It may require many generations of hybrids to produce the rose of one's desire.

Plants can also be grown from seeds formed through self-pollination; that is, by pollen from the same flower (or same plant) reaching the stigma and resulting in fertilization of the ovule. But the hybridist, or breeder, is more interested in trying to combine the best qualities of two different roses.

Selection of Parents

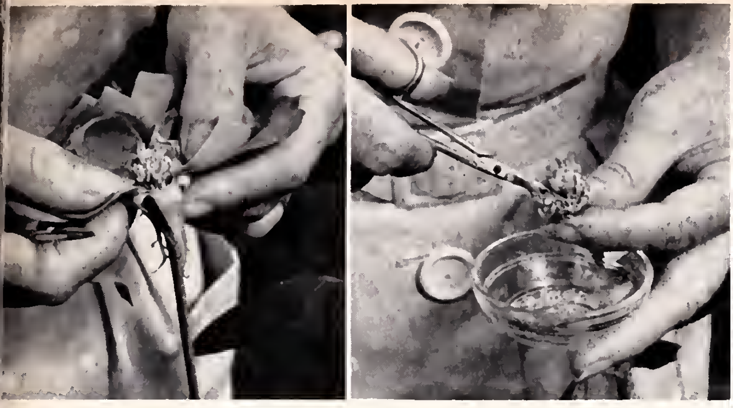
Which varieties to cross and which blooms to use are for the hybridizer to decide. It is important that crosses be finished early enough in the season to allow about 90 days for ripening before frost. Parents should be selected for some particular quality wanted in the offspring. Hardiness is one factor that most hybridizers are passing up in favor of other characteristics. Therefore, hybridizing with the hardiest known roses, such as the Gallicas, Mosses and Rugosas, might produce unusual and desirable results. Some of these have lavender and near blue colors found in no other rose. It will take much time and effort to get repeat-blooming seedlings, but it will be rewarding to work with these old roses. Hybrid Teas, Grandifloras and Floribundas may also give promising offspring.

Hybridizing Procedure

To cross two varieties, select the bloom to be used as a seed-bearing, or female, parent while it is about one-fourth open. This is best done in early morning. If the bloom has opened further, pollen could get onto the stigma and result in self-pollination.

Conard-Pyle

At this stage, petals of a rose should be removed in preparation for hybridizing.



Conard-Pyle; courtesy of Popular Gardening & Living Outdoors

Steps in hybridization: *Left:* Petals are carefully pulled off. *Center:* Stamens are clipped from a flower selected as a female parent. *Right:* Pollen from prospective male parent is applied with fine brush to stigmas of female parent. The narrow cones cover the pollinated flowers; they prevent chance cross-pollination by insects.

Remove the petals and cut off all the anthers. Examine with a magnifying glass to be sure no anthers are hidden, as these could also cause the bloom to become self-pollinated. At this stage the flower is not ready to receive pollen so it must be covered with a glassine bag until the stigma is ripe.

The flower selected for the male parent should be cut from the bush when it is nearly open. Remove the petals and scrape off the anthers, dropping them into a pillbox or envelope. Store the anthers in the house with containers open so the pollen will dry. As soon as the pollen is released from the anthers, close the containers and store them in a cool place.

Examine the stigmas of the bloom prepared as a seed parent. If they are ready to receive pollen they will be slightly swollen and sticky. Apply the pollen with a small artist's brush that has been sterilized in alcohol and thoroughly dried. Replace the glassine bag over the bloom and tie it securely so it can stay in place for several weeks. Attach a label under the bloom and record the name of both parents. Name the seed parent first, then the male parent, with a multiplication sign between them. Accurate records should always be kept.

In the fall, about mid-November, most of the hips will turn yellow or red; they are then ripe. Take them off the bush with a short stem and with the label attached. Store all the hips temporarily in a plastic bag on a refrigerator shelf where the temperature is 40 to 45 degrees Fahrenheit. The seeds can be extracted any time before the hips soften. To remove them conveniently, cut the hips into quarters. Rub the seeds between the hands to free any clinging pulp. Tie the cleaned seeds in a piece of cotton cloth, like a sachet bag. Use the string on the label to make the tie. Moisten the cloth, put it back in the plastic bag and return it to the refrigerator. Check for moisture at least every two weeks and if the seeds are drying, add enough water to make them slightly damp.

Seed-Sowing

It is best to sow the seeds in new flats that are 3 inches deep. Fill the flats to within ½ inch of the top with a mixture of 50 per cent peatmoss, 25 per cent sand and 25 per cent sterilized garden soil. The soil can be sterilized in a baking pan in the kitchen oven.

Sow the seeds in drills ¼ inch deep, spacing them ½ inch apart in the rows. Be sure to label each group of seeds. Cover them about ¼ inch deep with the same soil mixture as used in the flat and water thoroughly.

Conard-Pyle

Aftermath of hybridizing. ***Left:*** **Ripened hips (fruits) are gathered from the hand-pollinated flowers.** ***Center:*** **Seeds are removed from the hips.** ***Right:*** **Seeds are sown in carefully prepared soil.**

If a coldframe is available the seeds can be sown in early January and the flats placed in the coldframe. Mice are very fond of rose seed, so cover each seed flat by placing an empty flat of the same size over it. Place the flats in the coldframe, cover with a sash and with a blanket or other good cover over the sash. Put a few baited mouse traps or poison bait in the coldframe near the flats in case mice get in. No other attention is needed until the approach of spring. The flats should then be examined every few days. When the seeds start to sprout, remove the covers from the sash and flats to admit light and give ventilation on sunny days. If there are cold nights when the seedlings might freeze, the blanket should be replaced.

If a coldframe is not available the seeds can be kept moist in the refrigerator until the approach of spring and then planted in flats. To keep them from drying out after sowing, the flats can be kept wrapped in sheets of polyethylene until germination starts.

Care of Seedlings

When seedlings are very young they will need a lot of tender loving care. They should be watered sparingly on sunny days and only in the morning. Any water that remains on the leaves should be blotted off with a damp cloth. The seedlings require ventilation, especially on sunny days. They can stand much more cold than one would expect.

After the first true leaves form, put each seedling into a 3-inch pot, using the same soil mixture. Feed with a diluted fertilizer solution and when they are large enough, plant them in the garden. Some will bloom when only several months old but the first blooms will not be as good as those to be seen later.

Observation of Results

Some of the seedlings may resemble either of their parents while others may

Armstrong Nurseries

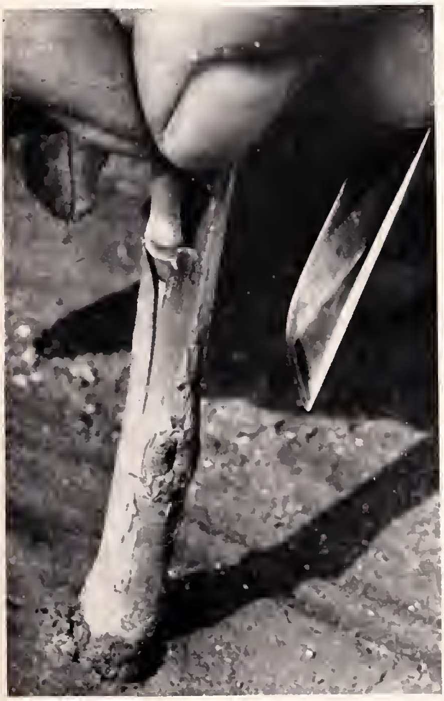
Promising-looking seedlings are planted in individual pots.

Schwartz

Three-month-old hybrid seedlings. ***Left to right:*** **'Ma Perkins' × 'Peace', light pink; 'Golden Sceptre' × 'Golden Masterpiece', medium yellow; 'Grand Opera' × 'Montzeuma', orange-pink; 'Helen Traubel' × 'Peace', near white.**

show no relationship at all. Those that fall short may be crossed back on either parent. There are usually a few that do exceptionally well and these should be budded onto a Multiflora understock.

Time and experience will teach which roses make the best parents. Some varieties set seed very poorly but make good pollen parents, while others are completely sterile. Seeds from certain varieties germinate with difficulty. Some parents pass on desirable characertistics to the young seedlings while others fail to do so. Observation of such behavior becomes the plant breeder's unwritten guide as he makes new crosses and back crosses. This is what makes rose hybridizing the most fascinating of all garden activities. ◆



Armstrong Nurseries

A promising seedling rose is grafted ("budded") onto a sturdy understock. The T-shaped cut in the bark of the stock, into which the bud from the seedling is inserted, is tightly bound, generally with raffia or a rubber band, to hold the stock and scion together while their tissues unite.

ROSES OF THE FUTURE

Views of leading hybridizers of what is ahead

David L. Armstrong

Armstrong Nurseries, Ontario, Calif.

AN increasing diversity of types of roses for many tastes and uses, along with improvements in performance and general plant qualities, will probably be the trend in the next ten to twenty years.

The single-stemmed rose will remain the most popular, though clustered roses will have their place, too. Extremely double roses of large and small sizes will become even more popular. Single and semi-double roses will make a comeback as cut flowers, with spectacular multicolor types with more interesting petal configurations and greater substance. Fragrance will be emphasized. There will be colors of greater clarity and resistance to fading along with beautiful variations of tone in the blends and multicolors.

Certainly not abandoned will be the urn-shaped bud and classical exhibition flower which will reach near perfection in a greater variety of colors than at present. However, along with extremely double types will come the introduction of elegant round buds, gracefully opening into a variety of interesting open flower forms.

Greater resistance to diseases and pests will make landscape use of roses more popular. Attractive plant and flowering habits for almost any garden requirement can be achieved. ◆

Eugene S. Boerner

**The Jackson & Perkins Company,
Newark, New York**

THERE are at present two very distinct new requirements for new roses: one, the specimen show types with fewer but larger flowers; the other, the continued advancement of the 'Spartan' type Floribundas. The latter are of course also the result of progression from Hybrid Musk roses which are descended from Pemberton's crosses on 'Trier'.

The 'Spartan' Floribunda roses have inherited almost disease-free foliage, which clothes the plants from the ground-level up. The flowers have taken the floriferousness of 'Pinocchio' but the size of the new ones will be like Hybrid Teas.

In another few generations we anticipate this group of roses to be dominant, with the giant specimen-flowered varieties to be the joy of the rose show fans and those who desire the unusual rather than a great supply of bloom.

The colors will not change from the basic trends now available. There may be a true blue rose, but the clear lavender prototypes and the lavender-tinted pink varieties now in commerce or coming are covering the so-called blue field just as the various shades of red and pink cover that field.

The red roses of the future will continue to have a predominance of yellow overtones, since this hue stays clean until the end in contrast to those with blue overtones, which have a tendency to become an unpleasant color at the finish.

Although there are many other beautiful forms, the high-centered bud and flower will continue to be the favorite; this form in the Hybrid Tea is still the ideal.

With the advent of 'Tropicana' and its distinct inclusion of species blood, I do not see much else in the immediate future with such dramatic possibilities. I saw this rose develop from its first basic cross, and hope that the work will continue with many ramifications.

With built-in disease resistance and the cutting down of care, I predict that the rose will be much more widely used, not only in rose gardens but in borders to supplement or replace shrubs. ◆

Wilhelm Kordes

W. Kordes Söhne, Sparrieshoop, Holstein, Germany

Looking back, we elders can see the sharp turns in the road that rose-breeding has taken these last fifty years. I remember the great impulse in the planting of roses in gardens brought about by 'Mme. Caroline Testout' and 'Kaiserin Auguste Viktoria'. They broke the way, before the end of the last century, for the Hybrid Teas and gave amateurs the possibility of planting roses much farther north than before.

The advent of Pernet roses did the Hybrid Teas a very bad service, for it brought blackspot to all the roselands and many enthusiasts who had begun planting roses, gave them up again.

Then the Polyanthas arrived, the small-flowered stuff; 'Orléans Rose' and its sports have had a tremendous distribution. But never content with what they had, the rose fans wanted bigger flowers. The Poulsen Hybrid Polyanthas did it for a while, then the breeders succeeded in getting the Floribundas—bigger and more double—always the demand of the never content. Well, it has run on till we now have the fine Floribundas with big flowers, in shape high-pointed like the finest Hybrid Teas and in all possible colors.

The same happened to the climbing roses: new varieties, hardy, repeat flowering have taken the place of the older once-blooming sorts. Hardiness was one of the great demands, not only against winter, but against fungus diseases of many kinds. In this line we have been successful so far—and if my understanding of the rose amateurs and rose planting people all over the world is right, it will be perfection in resistance against leaf diseases that is the goal of the thoughtful breeder, besides improvement of resistance to deep frost.

Perhaps not spectacular, but worth the work of the best. ◆

Walter Lammerts

Livermore, California

THE three most important tasks yet remaining for rose breeders to accomplish are: (1) achievement of petal substance and texture comparable to 'Baccara' and ideally 'Rumba'; (2) fragrance comparable to 'Crimson Glory'; and (3) blackspot and mildew resistance comparable to certain selected strains of *Rosa multiflora* which are immune to blackspot, and 'Descanso Pillar', 'Captain Thomas', and 'Tropicana', which are almost immune to mildew.

Fortunately, hybrids of 'Queen Elizabeth' and indeed even Hybrid Tea roses crossed with 'Rumba' show a remarkable variation in flower size, some being almost as large as the Hybrid Tea parent. Among these large-flowered hybrids many are almost as well textured as 'Rumba', and their thick petal substance gives them the same amazingly long-lasting quality. Progress in achieving Goal No. 1 should therefore be fairly rapid.

Fragrance is more subtle and unpredictable in its inheritance. However, if one or, preferably, both parents trace to 'Crimson Glory' or other roses of similar intensity of fragrance, one can be reasonably sure of recovering this fine quality somewhere in a population of 500 seedlings.

Petri dish tests using leaves of hybrid varieties and inoculating them with blackspot spore suspensions now give us accurate readings as to the degree of resistance. The same is true for mildew. Accordingly we finally have ways of accurately determining the resistance of hybrids to these two serious diseases, instead of depending on erratic field observations. Hybrids have been obtained combining the substance of 'Rumba' with the blackspot resistance of *Rosa multiflora*. Unfortunately, none of these are very fragrant nor do they have the bud form necessary for acceptable modern roses.

The fact that some seedlings having excellent substance are also fragrant indicates that there is nothing incompatible in this combination of genes. Accordingly, it is merely a matter of time and patience. We should, therefore, be looking forward to the introduction of such varieties within the next five or, at the most, ten years.

◆

E. B. LeGrice

Roseland Nursery, North Walsham, Norfolk, England

CLASSIFICATION as we now know it will vanish in the forseeable future, and all roses will be graded on a height basis. The general trend, I believe, will be to accentuate the types of growth, giving a wider range of size and purpose, but the blooms will become more uniform in size, shape and flower head.

When we consider the type of plant, progress will be made in healthier growth which must be determined, not by its amount, but by its flower-producing capacity.

Personally I would deplore the extinction of the single flower which with its five petals adds beauty, lightness and decorative effect, impossible to achieve in other ways. There will always be climatic conditions which will demand a less heavily-petaled bloom than the modern ideal.

If we turn to the flower we may still consider the classical high-pointed bloom as our aim. I think there may be a tendency for fewer but thicker petals so that the open flower will be as acceptable as its pointed bud in the earlier stage. There will be an increase in the lasting quality of the flower, both in time and color stability.

Undoubtedly one always looks forward to greater variations in color, although commercially it is the pure self color in red, pink or yellow which has the biggest sales potential. The mauves will become either more decided purples or more clear blues, and I would expect bicolor browns to become increasingly produced.

One day *Rosa hulthemosa hardii* will produce fertile seed, and then we shall have roses with the centers of the petal in one color zone, and the outer part a contrast.

Whatever variations there may be, the rose bush which flowers over the longest period will be the winner. ◆

Sam McGredy

Samuel McGredy & Son, Ltd., Portadown, Northern Ireland

MY hybridizing is done on a somewhat different basis from that in the U.S.A. First of all, I have only one climate (a sopping wet one) to contend with. I have little liking for Hybrid Teas, as Floribundas stand our rain much better. In a blackspot, rust and mildew heaven, I have to be much more disease conscious than my American counterpart. Consequently, my future is dependent upon disease-resistant and rain-resistant roses. My plans are all for plant and plant habit—not for colors, fragrance or sun-tolerance.

Two very definite lines are developing. The first, short term, is on disease-resistant Floribundas of tallish habit, going back to a seedling of *Rosa eglanteria* and 'Mme. Léon Cuny'. There is room for big roses which under your conditions react as semi-climbers, but under our conditions are really too tall, though they grow to a nice 4 feet amongst the smoke and dirt of our industrial cities.

The second line is dependent upon the disease-resistant properties of *Rosa macrophylla* and *R. spinosissima*. So far, I have raised three and four generations from these species. The plants are now continuous bloomers and strongly disease resistant. In the next 25 years I hope to put some decent flowers on top of them. I repeat, "I hope." ◆

Alain Meilland

Universal Rose Selection, Cap d'Antibes, Alpes Maritimes, France

IN the wonderful garden of the rose breeder's imagination, both reason and dreams have their place. It was the dream of the 18th century rose breeder to develop roses that would bloom from spring to autumn. This dream of yesterday has become the reality of today. Near the end of the 19th century it was a dream that we could have bright yellow roses blooming all summer. Within a few years, the advent of the Pernetiana strain made this dream true. In Hybrid Teas and Floribundas important progress for the years just ahead will be in the fields of greater fragrance and disease-resistance, both of which will appeal to the home gardener. The present trend promises that ten years hence we should have new shades with greater warmth in the reds and geranium reds, bright yellows and a greater diversity in bicolors.

Floribundas have been improved greatly during the last thirty years with an increasing number of petals, larger and better formed flowers, more diversified colors and more continuous bloom. I believe this development will continue. More than half the roses planted each year in the countries of northern Europe are Floribundas. There are two groups in the Floribundas; one with tall growth is well suited to the broad spaces of parks; the second, with shorter plants, provides jewels for family gardens. I believe that improvements will appear in both groups.

Beyond the next ten years we can dream of the possibilities. Our present garden roses have been developed from about 5 per cent of the wild species roses growing in various parts of the world. Undoubtedly, there lie untouched in the remaining 95 per cent factors with which we are not acquainted. Is it madness to hope for a gift from nature such as already has been given us through a mutation in the coloring that produced shades of geranium red? It is conceivable that someday nature will give us on her own, or with the help of irradiation, the blue color in roses which has, so far, proven a mirage to breeders. As I dream, I can see that in perhaps fifty years, or perhaps not for a thousand years, we may have roses as blue as forget-me-nots and other shades and colors not known in our roses of today. I believe that we may have thornless, perfectly formed roses with delicate scent, immune to disease and laughing at the sun and rain; roses beautiful, bright, gay and blooming every day from spring until frost as in Paradise.◆

Dennison Morey

General Bionomics, Santa Rosa, California

ROSE breeders are unquestionably men with visions. I do not suggest that we see the future clearly, but rather that we are convinced that roses will become better and that the use of roses in the garden will become more important.

Commercial breeders must concentrate on the popular types like Hybrid Teas and Floribundas that will produce marketable new varieties quickly. Nonprofessional rose breeders work on a small scale. Many are definitely amateurs but some are extremely accomplished. Taken all together they represent a significant amount of rose hybridizing. Since they are not economically dependent upon their breeding work, some of them set their sights on goals that may be extremely remote, but highly desirable. Primary considerations of many nonprofessional rose breeders are hardiness and disease resistance. To achieve these goals they use species roses. On the scale on which they operate, twenty years or more may pass before a commercially acceptable variety is developed.

Here at General Bionomics we are making a concerted effort to advance the efforts of the nonprofessional breeder. We are operating what we call the "Rose Gene Pool," which is designed to coordinate the work of nonprofessionals. We are prepared to provide them with technical and practical assistance, to make rare parents and pollen available, to supply propagation services and to test and evaluate seedlings. Most important, we are sympathetic to the work of the nonprofessional rose breeders. The Pool is too new to evaluate results, but I believe that within a few years we may reasonably expect to accomplish great improvements and innovations in garden roses and the use of roses. We already have in sight everblooming roses which can be grown in every State and in Canada; roses completely immune to blackspot, mildew and rust; roses resistant to aphids and spider mites.

(Concluded on next page)

I am confident that we can expect much greater advances in this field and that the shrub roses of today will become "old-fashioned" varieties within a few years. As the hardy, disease-free, everblooming rose shrubs are developed they will become combined with Hybrid Teas and Floribundas so that their virtues will become common in many new varieties of garden roses.

Nearly all rose hybridizers have recognized the importance and necessity of introducing new desirable traits into roses. The problem has been how to accomplish this. I believe the Rose Gene Pool will do it. ✦

Niels Poulsen

D. T. Poulsens Planteskole, Kvistgaard, Denmark

THE acceleration in rose-breeding over the past 15 years has brought us many lovely new roses. Will it be possible to follow up this evolution, so the future will bring us even better roses? What the answer to this question is, nobody knows; but as we still do not have the perfect red, yellow and pink Hybrid Tea, we have something to aspire to. Of course, the perfect rose will never be found, but breeders will never admit this, and each thinks that he himself will get the perfect rose one day.

Many new types of roses have been developed since the Second World War, and the future will undoubtedly bring us many more. Around 120 species of roses have been discovered, yet only eight to ten species have been used to create the roses we grow today. The remaining, more than 100 species, form a big treasury, so the breeders will never be out of work trying to find the diamonds in the treasure chest.

Even if there were no other species to interbreed with, we still have a very important work to do—breeding for hardiness and resistance. There is no reason for rose-breeders to breed for helping the chemical industry. We should try to select our seedlings more carefully, and sometimes look more for disease resistance and vigor than for color.

I am convinced the future will bring us some outstanding new roses.

Herbert C. Swim

Swim and Weeks, Chino, California

EVERY now and then over the past 25 years I have commented on this subject. Now I am beginning to feel a bit as though I were looking over my own shoulder, and not saying quite the same things I once believed.

A rose hybridizer must attempt to anticipate any trend in the taste of the rose gardener. He can then either influence or strengthen such trends if he is both correct and skillful.

In the Hybrid Tea class I see a growing interest in large flower size. Likewise, there seems to be an increasing awareness of such artistic qualities as graceful lines, balance, and color fastness and clarity in the flower. These qualities would therefore seem to be legitimate objectives for the rose hybridizer and we will no doubt see some advance on these fronts.

I believe I see a growing interest developing—or at least being uncovered—for low-growing, neatly formed Floribundas, that are sufficiently recurrent and free flowering as to create heavy color masses. Size of flower is apparently not as important as the coverage of the plant with flower color. Again, color fastness and clarity in the flower are of utmost importance.

There has been a continuing effort on the part of the world's rose hybridizers to achieve ever greater disease resistance. In my opinion some progress has been made and will continue to be made. I believe we will see an increasing number of new approaches attempted in the next few years. Some will without doubt carry some degree of success. We are all hoping for a "break-through" in this field. It would, we all agree, have enormous value for everyone interested in the rose. ✦

RECOMMENDED READING ON ROSE GROWING

Books in Print

Allen, Harold. Roses—Growing for Exhibiting. 175 pages, illustrated. D. Van Nostrand Co., Princeton, New Jersey. 1961. $4.95

Allen, R. C. Roses for Every Garden. 218 pages, line drawings and color plates. M. Barrows, New York. 1948. $4.50

Edwards, John Paul. How to Grow Roses, revised edition. 88 pages, illustrated, plus 8 color plates. Lane Publishing Co., Menlo Park, California. 1960. $1.95

Lewis, C. H. and Allen, R. C., editors. What Every Rose Grower Should Know, 6th edition. 84 pages, illustrated, plus color plates. American Rose Society, Columbus, Ohio. 1965. $1.75

Milton, John. Rose Growing Simplified. 128 pages, illustrated, plus color plates. Hearthside, New York. 1962. $3.50

Milton, John. The Rose Question and Answer Book. 192 pages, illustrated. Hearthside, New York. 1965. $3.95

Pinney, Margaret E. The Miniature Rose Book. 149 pages, illustrated, plus color plates. D. Van Nostrand Co. Princeton, New Jersey. 1964. $5.95

Rockwell, F. F. and Grayson, Esther C. The Rockwells' Complete Book of Roses. 332 pages, line, halftone and color illustrations. Doubleday & Co., New York. 1958. $5.95

Thomson, Richard. Old Roses for Modern Gardens. 154 pages, illustrated, plus 26 color plates. D. Van Nostrand Co., Princeton, New Jersey. 1959. $7.50

Thomson, Richard and Wilson, Helen Van Pelt. Roses for Pleasure. 207 pages, illustrated, plus 8 color plates. D. Van Nostrand Co., Princeton, New Jersey. 1957. $5.95

Westcott, Cynthia. Anyone Can Grow Roses, 4th edition. 220 pages, illustrated. D. Van Nostrand Co., Princeton, New Jersey. 1965. $3.75

Wilson, Helen Van Pelt. Climbing Roses. 212 pages, illustrated, plus color plates. M. Barrows, New York. 1955. $3.95

American Rose Annual. 200 to 250 pages, illustrated partly with color plates. Issued annually to members by American Rose Society, Columbus, Ohio.

Books Not in Print in the U.S.A.

LeGrice, E. B. Rose Growing Complete. Faber & Faber, Ltd., London. 1965. 43/6

Shepherd, Roy E. History of the Rose. 264 pages, illustrated. Macmillan Co. New York. 1954.

Thomas, Graham Stuart. Climbing Roses Old and New. Illustrated by the author. Phoenix House, London. 1965. 45/.

Thomas, Graham Stuart. Shrub Roses of Today. 240 pages, illustrated, plus 8 color plates. Phoenix House, London. 1962.

◆

CONTAINERS

(*Continued from page* 35)

during the growing season. Be sure to read the manufacturer's directions carefully, and use the exact concentrations recommended.

Winter Protection

Except in warm climates, roses in containers need winter protection. Place them in a wind-free corner out-of-doors, preferably all in the same place, and protect them from winter sun. Set the containers on boards or bricks. Before the weather gets really cold (that is, before the ground freezes), give the plants a thorough watering. Place leaves, straw, salt hay, or sawdust on top of the containers and around them as insulating material. A chicken-wire fence around the cluster of containers will keep the wind from blowing away the mulches or other protective material. Burlap can be used similarly.

Around the canes of climbing roses tie a sheath of evergreen branches for protection against the sun. The trunks of tree roses should be similarly protected, or covered with Tree Wrap, a material that is available in four-inch-wide rolls. Burlap should be placed around the crown. Retain these protective devices in the spring until all danger of freezing has passed.

Pruning

In spring, when cold weather is over, cut out all dead and diseased branches. Roses in containers grow more slowly and are less vigorous than roses planted in the garden. This means less, but more discreet, pruning. ✦

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A HANDBOOK OF PHOTOGRAPHS

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AUTUMN 1965

NEW SERIES

Vol. 21 No. 3

LANDSCAPING TERMS

Brief interpretations of some terms and principles used in landscape design

AXIS. An imaginary line around which BALANCE is created. In a formal garden it is the center line. The axis is commonly terminated by a FOCAL POINT, although a small achitectural feature such as a sundial or a small pool may be placed along the axis, as at its mid-point.

DEFINITION. In landscaping, distinctness of design achieved through visual limitation of boundaries.

FOCAL POINT. A center of attention, often an architectural feature used as a point of interest; one of the elements of good landscape design.

FORCED PERSPECTIVE. An illusion of greater length gained (1) by having lines converge slightly in the distance or (2) by using finer textures and cooler colors in the background to give the effect of distance. The reverse impression is obtained in the view back from the far end of the garden.

MASS EFFECT. One general form of plant used in large quantities. Sizes of masses should vary to avoid monotony in pattern.

PROPORTION. A definite relationship between masses. A rectangle with a 5 by 8 ratio is said to have pleasing proportion. As this ratio becomes more equalized but the form is neither clearly square nor rectangular, it is considered undesirable.

SCALE. Relative size of parts and whole. Architectural elements as well as plants should be in scale with one another. Narrow steps leading from a wide terrace would be out of scale; so would a small pool in the center of a large paved or grass area.

SCULPTURAL LINE. Strong, clean-cut contours, as in certain tree branches, that give a massive rather than a delicate effect.

STRENGTH OF DESIGN. A character gained by REPETITION and by use of a FOCAL POINT. Example: a low edging or a hedge that repeats the line of a walk and thus accents and strengthens the garden pattern.

STRUCTURAL UNITY. Repetition of line and of material. Examples: brick that is used in a terrace and repeated in the walk and edging of flower beds; repetition of horizontal or vertical lines in different materials.

TEXTURE. Surface character. Size and placement of the smaller units, e.g., the leaves of a tree or shrub, determine the over-all texture. For example, the honey locust in full leaf is a fine-textured tree; magnolias are coarse-textured.

UNITY. Harmony between parts achieved through similarity or the proper subordination of minor parts.

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For Points to Keep in Mind in Home Landscaping, see page 65.

PLANTS & GARDENS

Vol. 21 Autumn (November) 1965 No. 3

CREATIVE IDEAS IN GARDEN DESIGN
A HANDBOOK OF PHOTOGRAPHS

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Autumn 1965

Most gardeners and amateur horticulturists recognize and appreciate the artistry that characterizes a fine garden, but proportionately few know how to accomplish this in their own gardens.

Achieving success in this surprisingly elusive field of garden design is not easy. It is one thing to grow plants well, but quite another to assemble them into a pleasing pattern. In short, the key problem in making a beautiful garden is to translate artistic thoughts into garden dimensions.

Are there rules to follow? Yes and no. To bring the artistry of plant life into the sphere of one's own pattern of living is the very essence of successful gardening. Tastes differ. Environments differ. Human cultural traditions vary in different families, in different regions and in different countries. Yet wherever one lives, with study and practice, he can capture the spirit of nature in a small space, call it a garden or what you will. In general, it is advisable to avoid novelties; they rarely add quality to a garden, and seldom have lasting appeal.

A garden's excellence is often judged in the spring when at peak bloom. Admittedly, this is a dramatic time, yet there can and should be subtle charm at every season.

More than 80 beautiful photographs are presented here—selected from hundreds examined by Guest Editor Harold Perkins and our Editorial Committee. As you will see, pictures comprise virtually the entire Handbook. They are classified according to garden objectives; and their captions describe, analyze and explain the principles of landscape design in a form we hope readers will enjoy. The inspirational value of a single picture may be the equivalent of a thousand words in helping one visualize his own garden's possibilities.

George S. Avery, Jr.

Director

> "America has moved outdoors. Nobody will deny that. But what may not be so readily apparent is that the move has produced a change in the design of home properties. . . . Essentially, the American Style garden is a new version of a garden built for pleasure. It is part outdoor playground and part living room . . . a place in which everyone may watch the drama of the changing seasons, and see the miracle of life unfolding in a plant, where people may put their own stamp on their surroundings."
>
> Elizabeth Gordon
> *House Beautiful*, February, 1951

GARDENS DESIGNED TO FIT ONE'S WAY OF LIFE

Harold O. Perkins

TO be wholly satisfying, a garden need not be of large dimensions. It may be as diminutive as a terrace that has space for but two or three potted plants. Sometimes one small garden may connect with another garden, or flow into an open stretch of lawn or meadow or lead toward a bit of natural woodland.

Whatever its size, a garden should be something to stir the imagination, something to help us forget for a time the perplexities of the day, something to give enjoyment. A garden of great charm is not created without effort. It is a studied affair, yet so subtly put together that it has an appearance of being casually refined and well organized. Man can take a few of nature's many elements and arrange them to further enhance their beauty.

Europe has many large gardens that are showpieces. In the United States we are blessed with a great number of small, well designed gardens that have been planned, as they should, to fit into our own way of life. There are more of these than we have given ourselves credit for.

We enjoy casual living out of doors—a cookout for two or twenty, a pick-up meal on the terrace, quiet relaxation, a pleasant place to read. For all such activities, a garden provides an appropriate background.

Our modern-day tempo demands a garden that is easily maintained. And since the space that we have for all of this is frequently very limited, it must be carefully planned if it is to provide the fullest enjoyment.

Vergil, two thousand years ago, would seem to have had our times in mind when he said, "Praise large estates but farm a small one."

AMERICA'S GARDEN HERITAGE

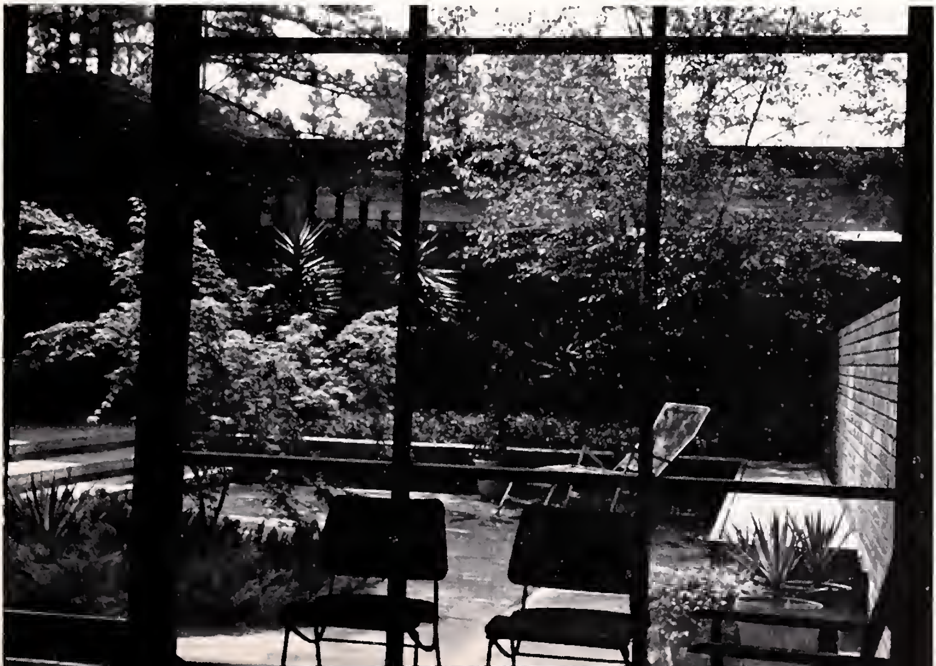
Mary Deputy Cattell

GARDENS of today as pictured in this handbook of garden design are an inheritance of many schools of design from various countries, adapted to reflect the present-day mode of life. They differ in size, material and form in different sections of the country, but all have certain characteristics in common.

In the sections first colonized in what became the United States of America, namely New England and Virginia, the original styles from the late 17th and the 18th centuries have persisted in older gardens and have been copied in many of the newer ones. The New England garden is for the most part limited in area, and restricted to plant material for the northern climate. Gardens stemming from the Virginia style of the 18th century are formal and of English ancestry, often of considerable size and in keeping with the architecture of the large plantations and great houses of that century. Many of them have been restored very much as they were originally and these are beautiful and imposing. There were also fine smaller gardens, as in Williamsburg. The Williamsburg Restoration itself has had tremendous effect on gardens all over the United States. This is partly because of the quality of the design and partly because the conditions of gardening today are somewhat similar to those of the 18th century. Since Williamsburg was the colonial capital, space was limited in the settled area, so there were rather small grounds for each house except the Governor's palace. The garden labor was not highly trained professionally, but the owners were interested and, with study of existing gardens and of English books, they frequently developed the designs themselves. Some French influence was also felt. Many of the gardens have been copied or adapted in present-day suburban areas. Plants are, of course,

PATIO FOR PRIVACY. Outdoor sitting room with restrained use of plants links house with grounds. Sunken garden effect is achieved with low wall and steps down to flagstone paving.

Lewis Clarke, *Landscape Architect*



different from those in the North, with far more broad-leaved evergreens, and a wide range of other woody material and many bulbs, but fewer perennials.

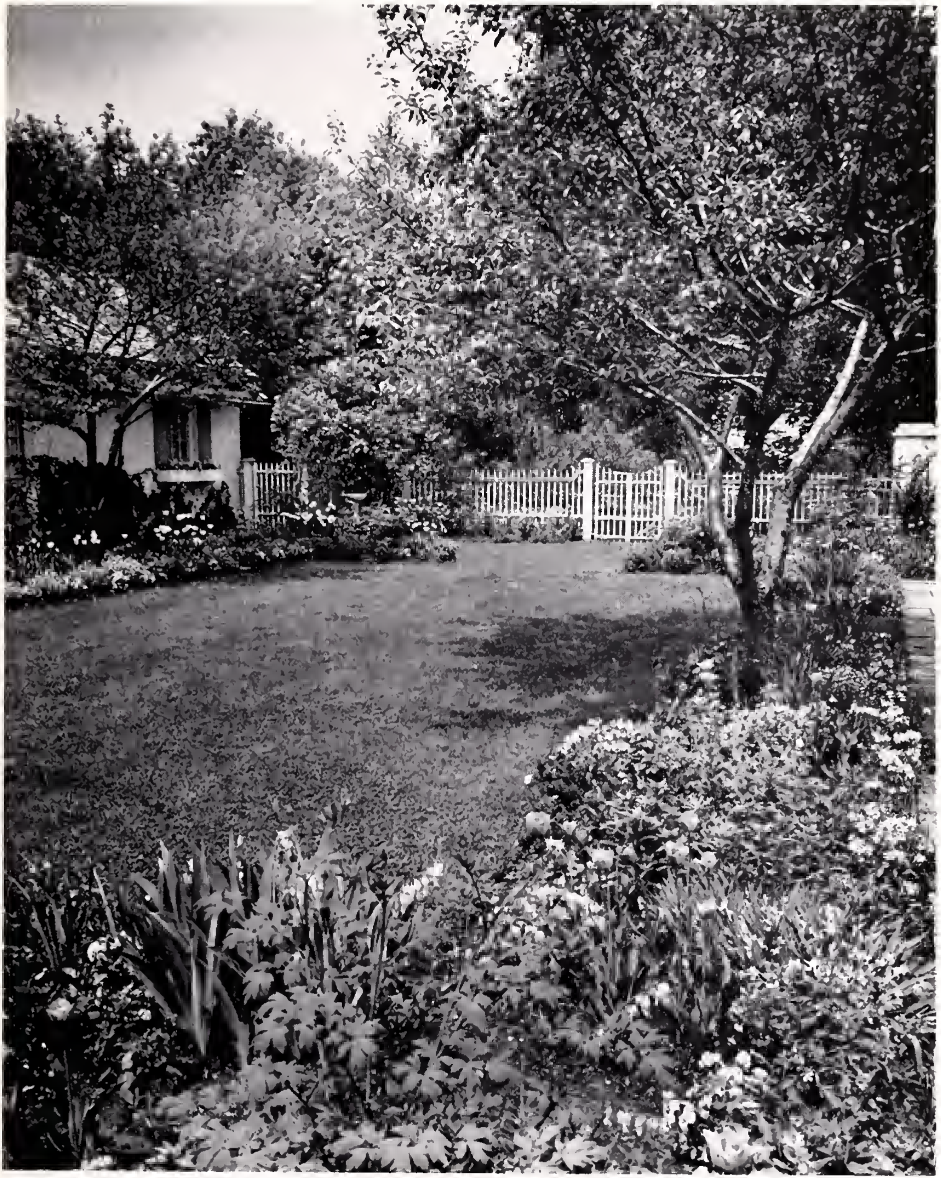
During the 19th century in parts of the country in which large estates were developed, the more naturalistic form of gardening exerted its influence. That school of design had excesses, particularly in England, where fake ruins and so-called naturalistic or picturesque planting often replaced beautifully formal gardens. The effect of this style, which originated with Sir Humphrey Repton and other landscape designers of the time, is still recognizable in some of the old places in the United States, identifiable largely by the survival of fine groups of trees. Many of the places along the Hudson River, done by the early landscape architect Andrew Jackson Downing, became famous in their day. Downing's work stems from the naturalistic movement in England. There was constant introduction of imported and native trees with strong interest shown in their placement. Great stress on the appreciation and utilization of the natural forms of the land itself mark this whole period in both England and America. The devastation of natural topography and destruction of trees characteristic of present-day builders was fortunately not undertaken then, largely for lack of machines.

During the latter half of the 18th century there were, of course, many over-elaborate examples of Victorian taste outdoors, just as in some of the furniture and architecture of the period. The swing from the natural school of landscaping to the hideous over-clipping and bad topiary work of the latter part of the century has been partially taken care of by time itself. As labor became scarcer and less well trained, artificial pruning had to be reduced. A few outstanding examples of the real art of topiary work do remain but the problem of gardeners' time has eliminated much of the worst of it. An effect of restlessness and clutter was caused by the trend of thinking that every spot must have a "specimen" or a "feature." This has given way, for the most part, to a change in taste and way of life demanding elimination of spottiness in favor of more open areas. The round, star or crescent bed has largely vanished with the iron animals, so it is now a subject of mirth rather than admiration or envy.

Today's way of living has in itself re-designed many gardens of the older type and necessitated certain adaptations that are interesting in themselves. Nowadays, as our houses get smaller, we live outdoors more and must give more planning and attention to our outdoor quarters. This mode of life is accompanied by the fact that the days of well-trained and available gardeners are very much a thing of the past. The places must be so planned that they can be taken care of fairly easily with economy of both time and money, usually either by the owner himself or with rather casual gardener help. This has simplified over-all design and reduced a great deal of unnecessary planting. In general, present-day grounds are more open and more restful than their immediate predecessors. On the other hand, plant exploration and hybridization are bringing us so many new plants that they are as much a problem as an advantage. There is a temptation to introduce too many new elements, often losing sight of the spaciousness and simplicity of a unified whole. Since grounds around most houses are actually much smaller than formerly, it is very easy to overcrowd a place simply because the space is limited and the desirable plants are apparently limitless.

The change in contemporary architecture, of course, influences the landscape whether it is a flower garden or open grounds. The mass of heavy foundation planting in the early part of this century is fortunately being ruled out by present-day houses. Whatever the style of the house, it needs to have very carefully chosen plant material and comparatively little of it. We frequently demand much more paved area and therefore less grass and fewer plant masses of various sorts on all of the grounds. It is possible to plan a thoroughly contemporary house with a traditional garden somewhere in the picture but in general the style of the gardens themselves is less traditional than it was thirty years ago, unless the house itself is of definite traditional period architecture and demands its counterpart outdoors.

We must meet today's demand with a strong heritage of the best of the past in garden design. Our design form has not yet crystallized into a definite American style but it is taking shape and, in many sections, producing interesting new gardens.

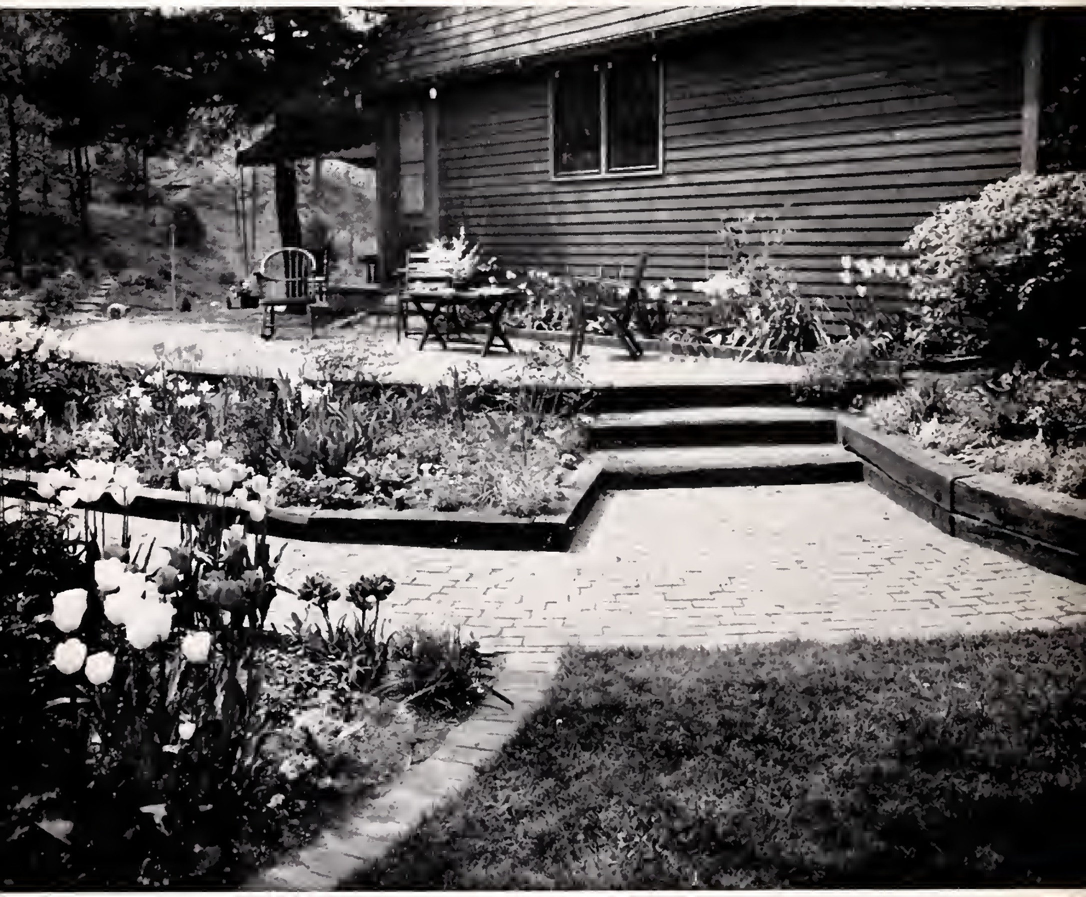


Helen Page Wodell, *Landscape Architect* *Gottscho-Schleisner photo*

CASUAL DESIGN. The focal point of this garden is the white gate at the end of the open grass panel. The two asymmetrically placed crab-apple trees give informality to the design.

GARDENS TO LIVE IN

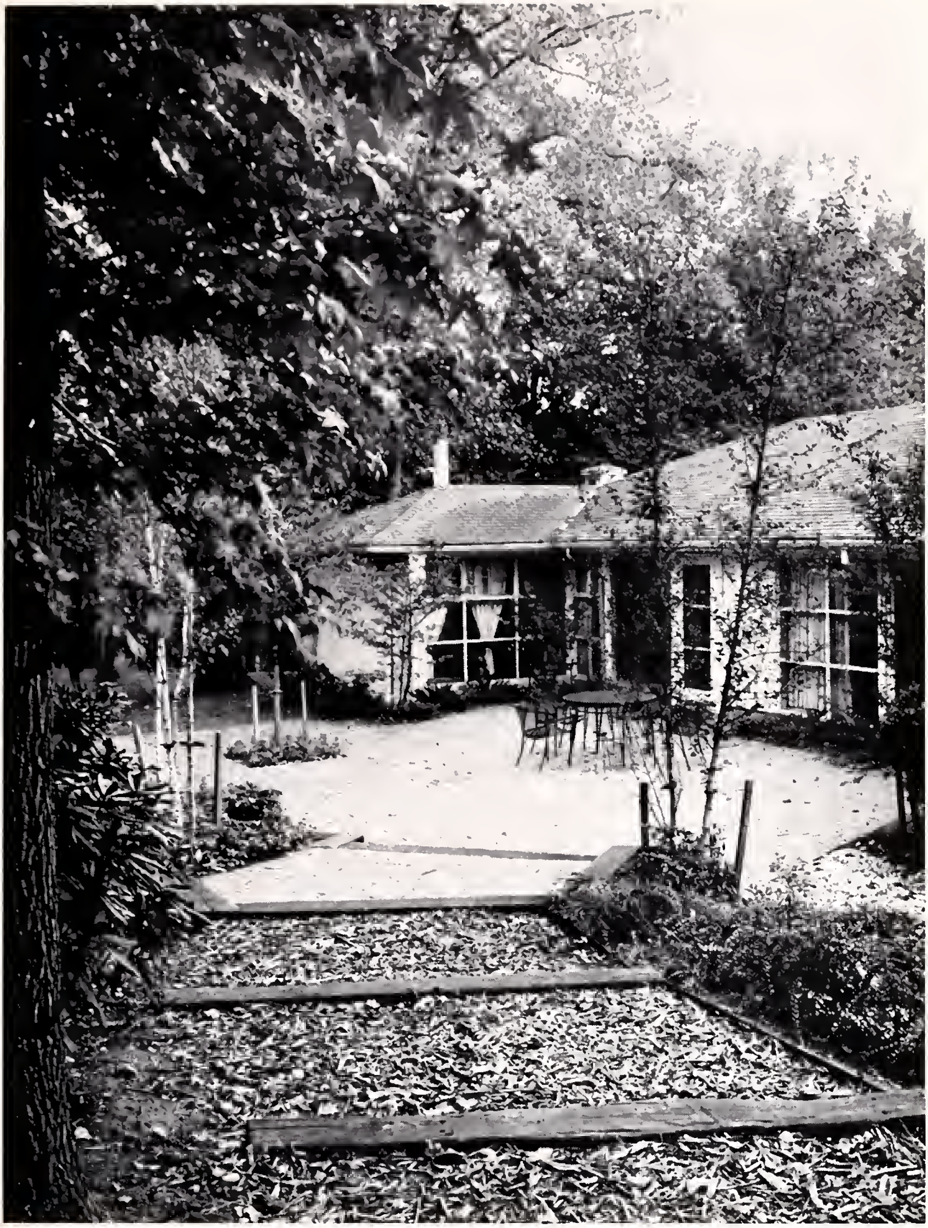
> "Living space is as much the reality of your garden as it is of your house. If it has no place for you to sit in comfort, either in a sun pocket on a cool day or in the shade on a hot one; if there is no place for the children to play freely, for you to plant with pleasure or to entertain without pain, then your garden is as empty of shapely form and spaces as it is empty of personal, human content and meaning for you."
>
> Joseph A. Barry
> *House Beautiful*, May, 1957



Paul E. Genereux photo

William Lommerse, *Landscape Designer*

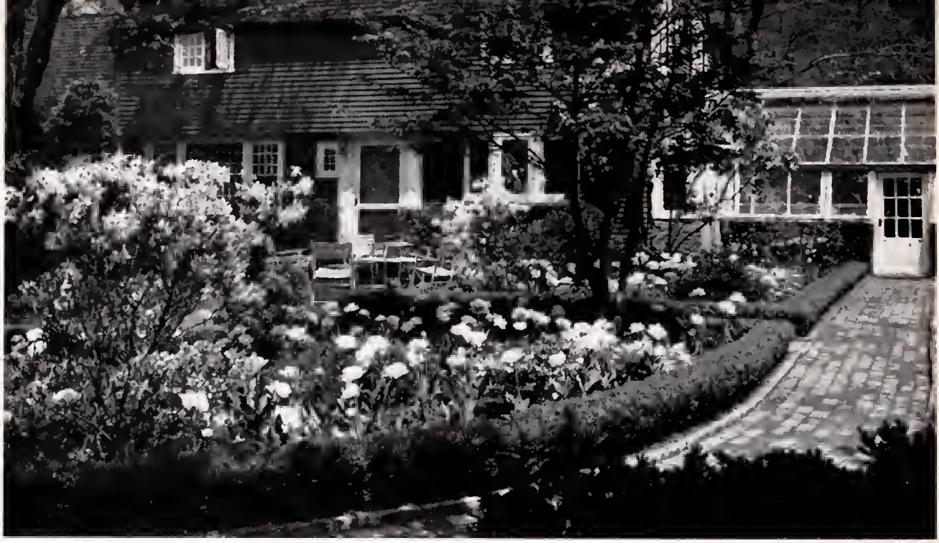
RHYTHMIC DESIGN. Curved lines in timber edgings and in pattern of brick work on sun terrace impart a feeling of rhythm to this garden scheme. The timbers are old railroad ties which serve as retaining walls and as risers for the steps. The intimate relationship of house and garden is at once apparent.



Mal Gurian photo

Goldberg & Rodler, *Landscape Designers*

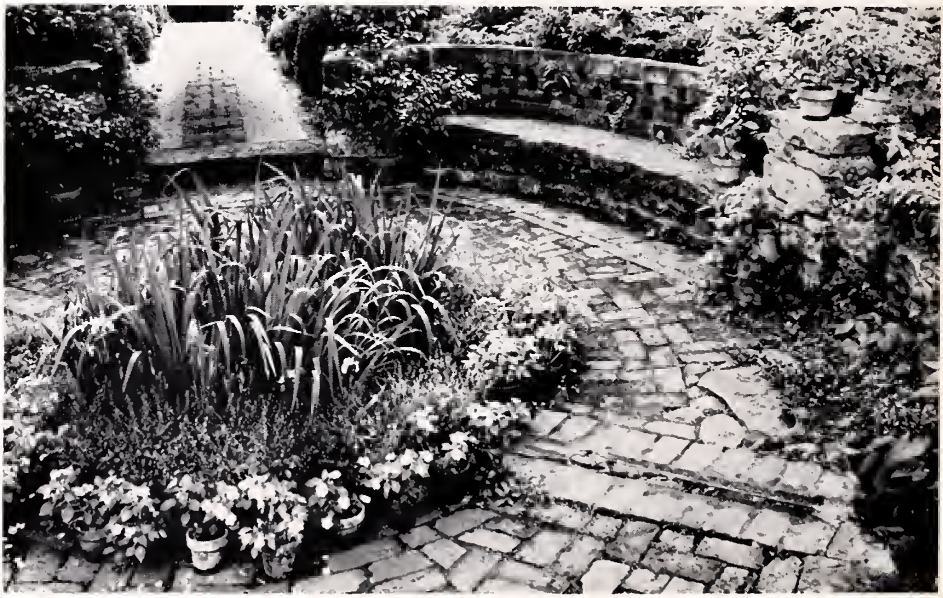
EFFECTIVE TRANSITION. Sloping path from woodland garden leads to a brick-paved patio close to the house. The transition from the wood-chip walk is made with a top step of brick framed in by railroad ties. Ties at 8-foot intervals across the path serve as low risers for ease in walking. Pine bark mulch can be used in place of chips; it is of finer texture. The sweetgum tree *(Liquidambar styraciflua)* beside the path gives brilliant autumn color, and the rhododendron visible from windows of the house is green throughout the year. Low-growing cotoneaster, at right of path, has colorful red berries in autumn.



Gottscho-Schleisner photo

Janet Darling & Richard Webel, *Landscape Architects*

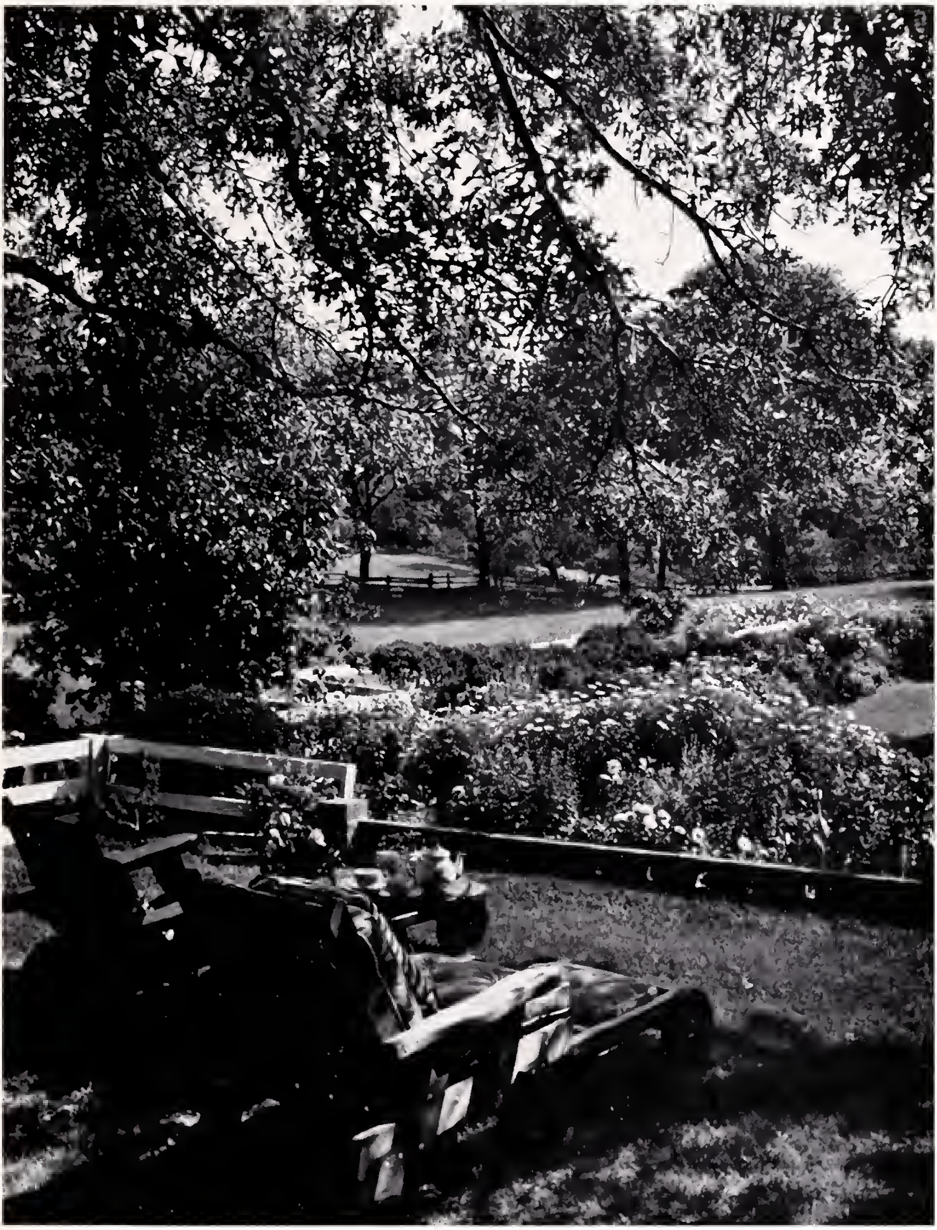
THREE LEVELS OF SPRING BLOOM. The low hedge that surrounds the tulips defines and emphasizes the garden pattern; a flowering tree gives height to the whole scheme. The spring-flowering shrubs—royal azalea *(Rhododendron schlippenbachi)* and Japanese pieris *(P. japonica)* among them—bloom at the intermediate level. Tulips can appropriately be followed by annuals planted in large masses of solid colors for long-season bloom.



Gretchen Harshbarger photo

Henry Fletcher Kenney, *Landscape Architect*

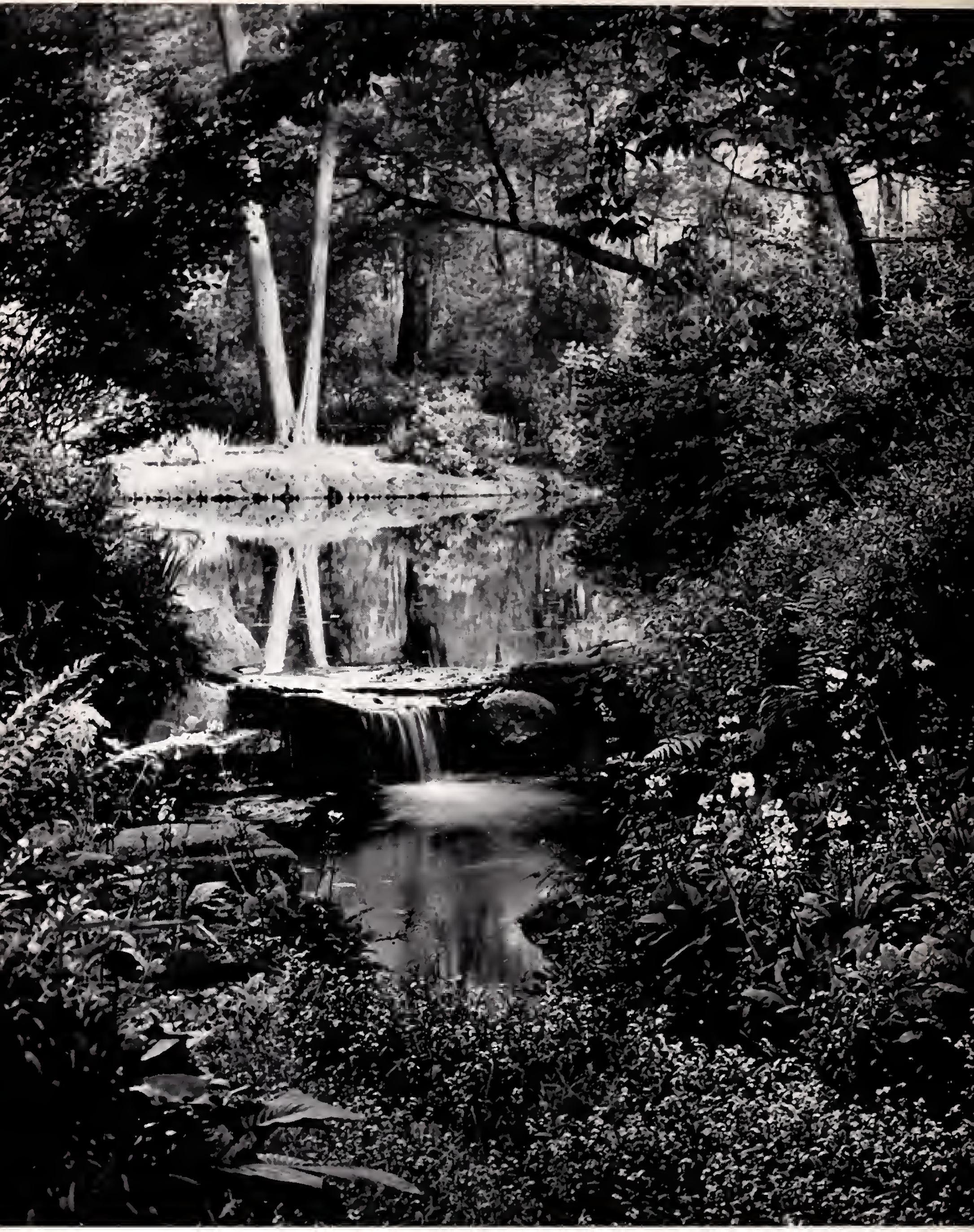
ENTICEMENT THROUGH DESIGN. A circular layout such as this tempts the eye to move from one sector to the next and on to the adjoining walk, where the view adds to the apparent size of the small planted area. The step, with a 6-inch riser, further emphasizes the lower garden. Potted plants of varieties of *Impatiens,* which flowers continuously, line the inside edge of the 4-foot brick path.



Gottscho-Schleisner *photo*

Mrs. H. I. Nicholas, *Landscape Designer*

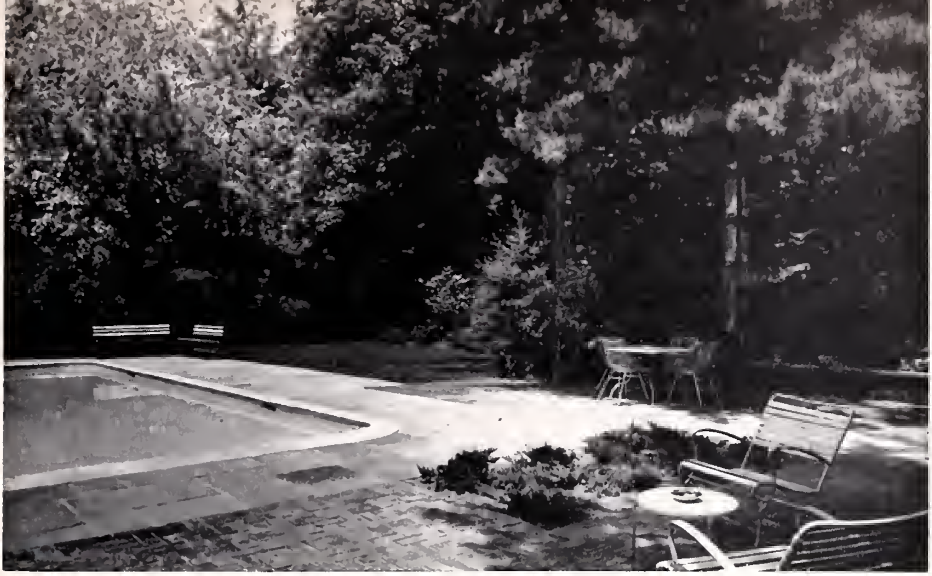
DISTANT PROSPECT. Raised terrace provides a long view into the meadow and woodland beyond the garden. Undulating sweep of lawn adds to the naturalness of the distant scene.



Gottscho-Schleisner photo

Innocenti & Webel, *Landscape Architects*

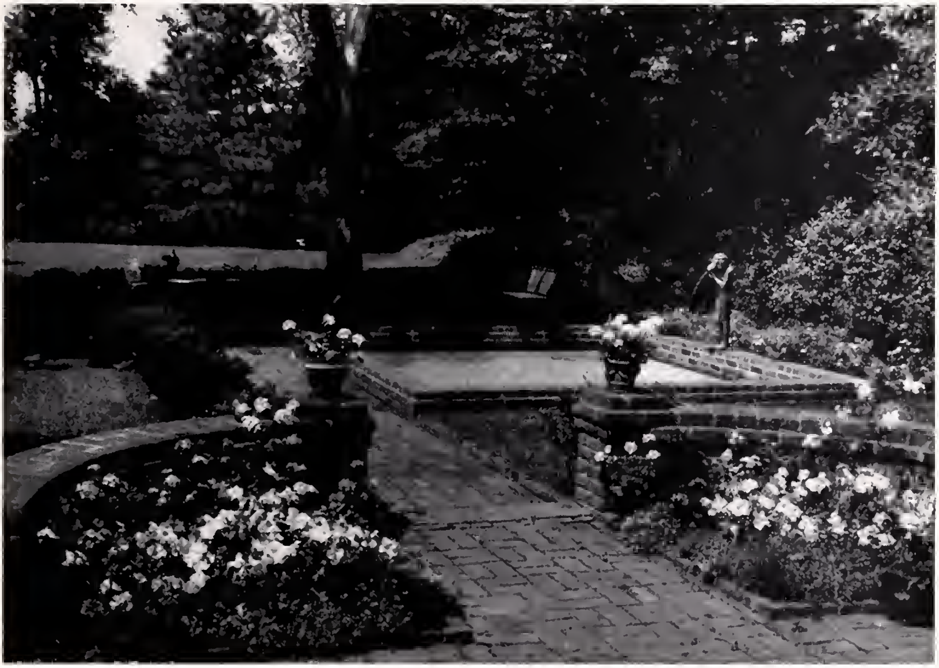
CONTRASTS IN NATURE. Quiet pool and small waterfall offer contrast of sight and sound in woodland garden. Forget-me-nots *(Myosotis)* and Japanese primroses *(Primula japonica),* both suited to wet areas, bloom among native ferns, shrubs and trees.



Mal Gurian photo

Goldberg & Rodler, *Landscape Designers*

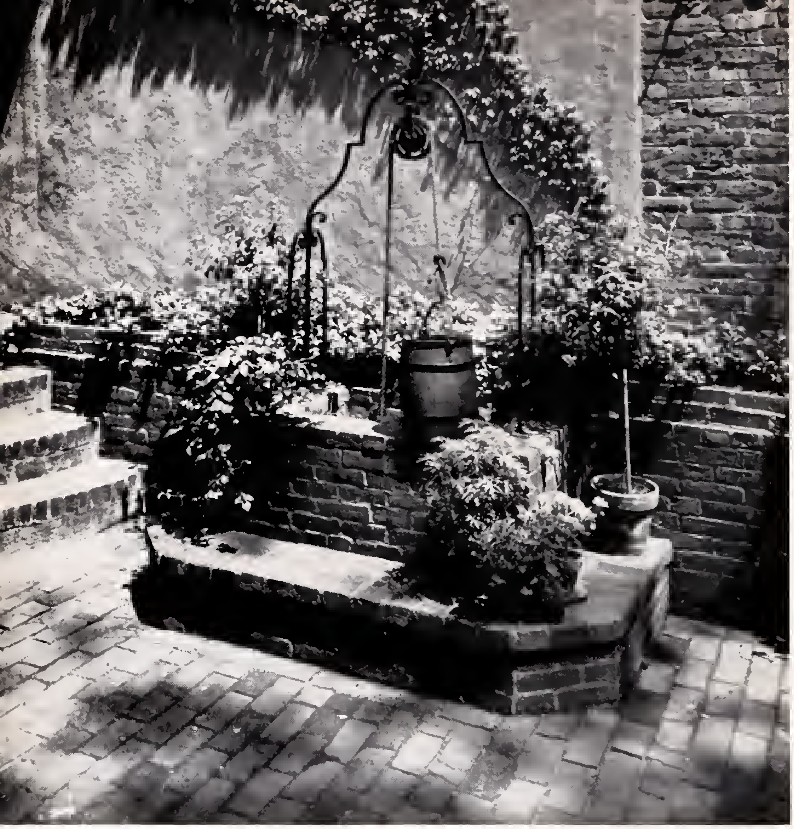
PLANNED AND PLANTED CONTRASTS. The large expanse of paving is relieved by a bed of low spreading junipers. A swimming pool can become an important part of the garden when surrounded by some non-glaring paved areas, irregular stretches of open lawn, and masses of shrubs and trees.



J. P. Roche photo

Eleanor McClure, *Landscape Designer*

WATER AS AN EMBELLISHMENT. Italian ceramic pots clearly mark the passageway to the rectangular pool and shaded sitting area beyond. The fountain's small bronze figure is in scale with the pool, which is about 10 feet square. Dwarf Japanese yews, restrained by light pruning, separate lawn from garden.



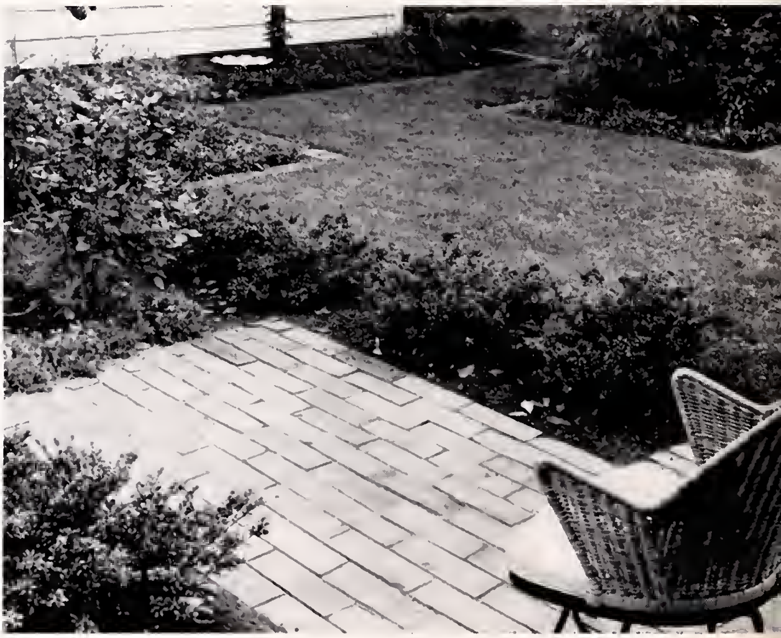
WATER FOR USEFULNESS. A dipping well can be a serviceable as well as charming feature of a garden. The simple wrought iron frame for the pulley is both decorative and functional, as is the brick base, which can serve as a garden seat. Potted plants are pleasant against the brick. The tracery of vines with shadow pattern offers just enough plant growth to soften the massive wall.

Mrs. Charles Townsend, *Designer*

Paul E. Genereux photo

STRUCTURAL UNITY. Repeating the brick of the terrace in the edgings of the beds ties the elements of the garden together. To keep the geometric design in evidence as the garden matures, attention must be given, in the initial selection of plants, to their texture and the ultimate size that they are allowed to attain. For example, the holly *(Ilex crenata convexa)* in the foreground can be kept low by periodically cutting the longer branches.

Carlton Lees, *Designer*



Gretchen Harshbarger photo

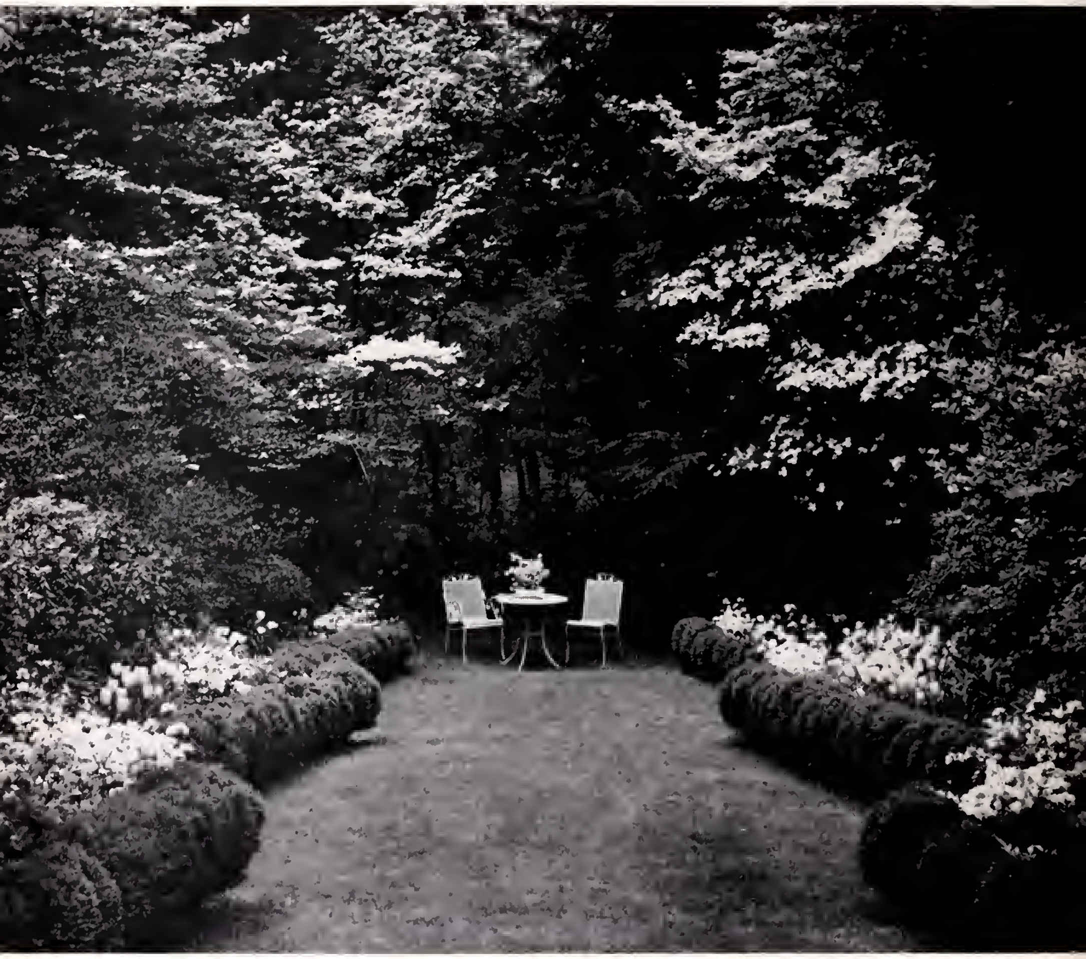
Paul E. Genereux photo

William Lommerse, *Landscape Designer*

SUCCESSION OF BLOOM. Along curved path to cookout shelter, peonies and other perennials furnish continuous bloom after spring bulbs are past; later, low annuals can be planted as a companion "crop."

FOCAL POINT. This small garden house is not only a pleasant place in which to sit, but is also a focal point which gives strength to the garden design. The upright yews which soften the dominant architectural lines have been trimmed in an interesting manner, more pleasing than a sheared pyramidal form. Extending the brick paving from garden house into lawn area gives added importance and usability to the shelter. ►

* * *

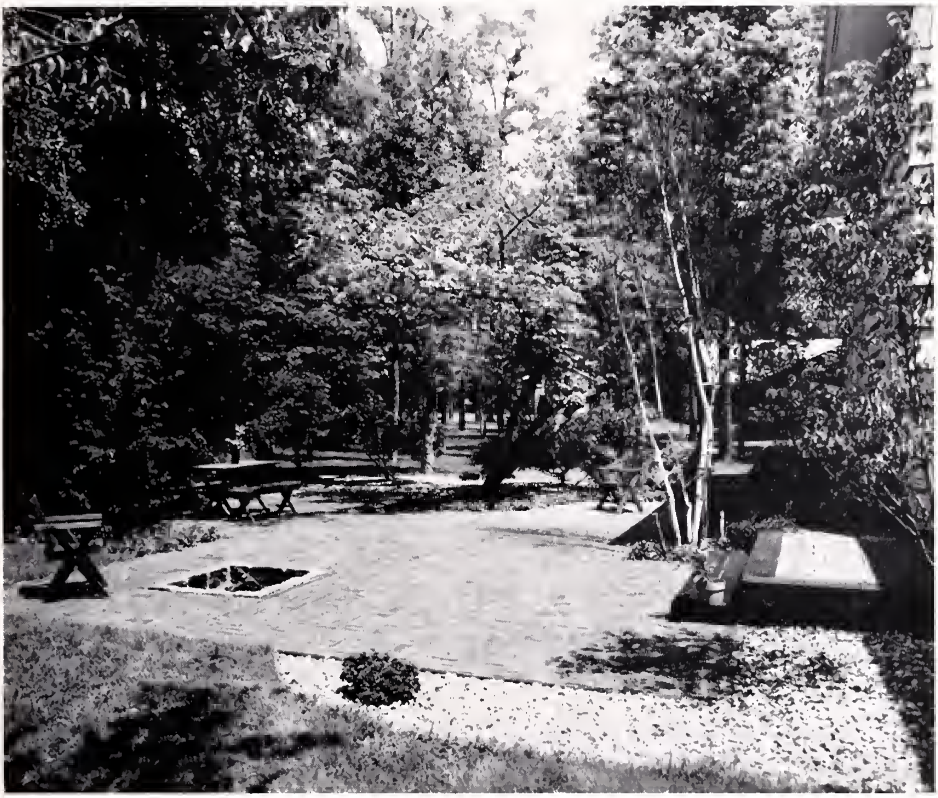


Gottscho-Schleisner photo

Mrs. Norman B. Baker, *Landscape Architect*

FORCED PERSPECTIVE. Broken diagonal lines of hedge make grass panel appear much narrower at end, thus at a greater distance. They also lessen formality of design. Dark foliage of dwarf boxwood *(Buxus sempervirens suffruticosa)* sets off lighter, brighter colors of spring-blooming azaleas and tulips.

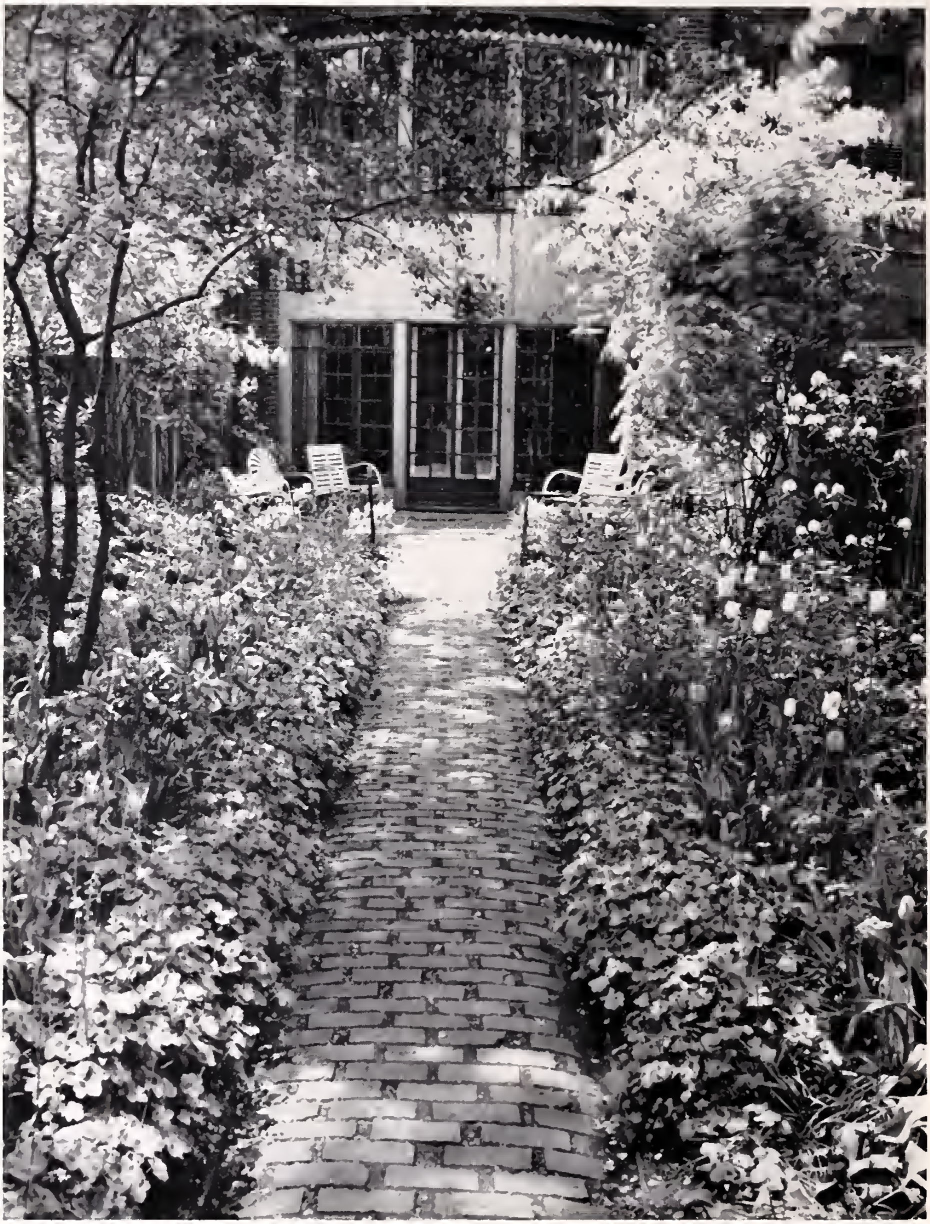
Dorothy R. Morris, *Landscape Architect* *H. H. Allen Morris photo*



Mal Gurian photo

Goldberg & Rodler, *Landscape Designers*

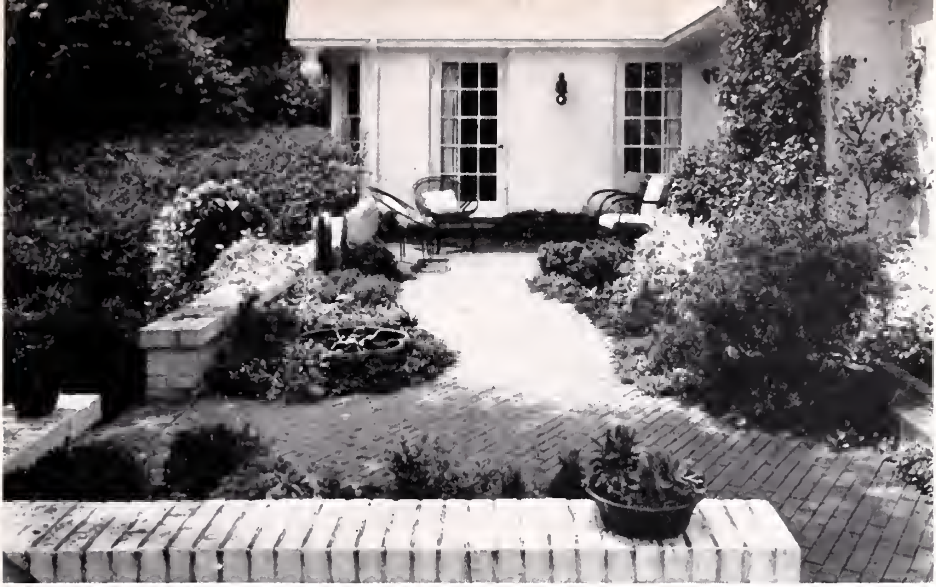
OFFSETTING STRAIGHT LINES. On a terrace of rectangular design an irregularly shaped flowering dogwood *(Cornus florida)* relieves the formality. Baltic ivy *(Hedera helix baltica)* makes an excellent ground cover in partially shaded areas, as under the tree. The sunken fire pit is an invitation to family cookouts, and the glow of burning embers adds to late evening enjoyment of the terrace and its plantings.



Paul E. Genereux photo

Mrs. Frank Nichols, *Designer*

OBSCURING LENGTH. The multiple-stemmed tree at left of garden path catches the eye before it reaches the terminal feature—the house and sitting area, which are at a considerable distance on this narrow city property. Contrast of the wide paved sitting area with the 4-foot path has the effect of shortening the long walk. The dark-colored foliage of coral-bells *(Heuchera sanguinea)* provides an edging that remains green much of the year.



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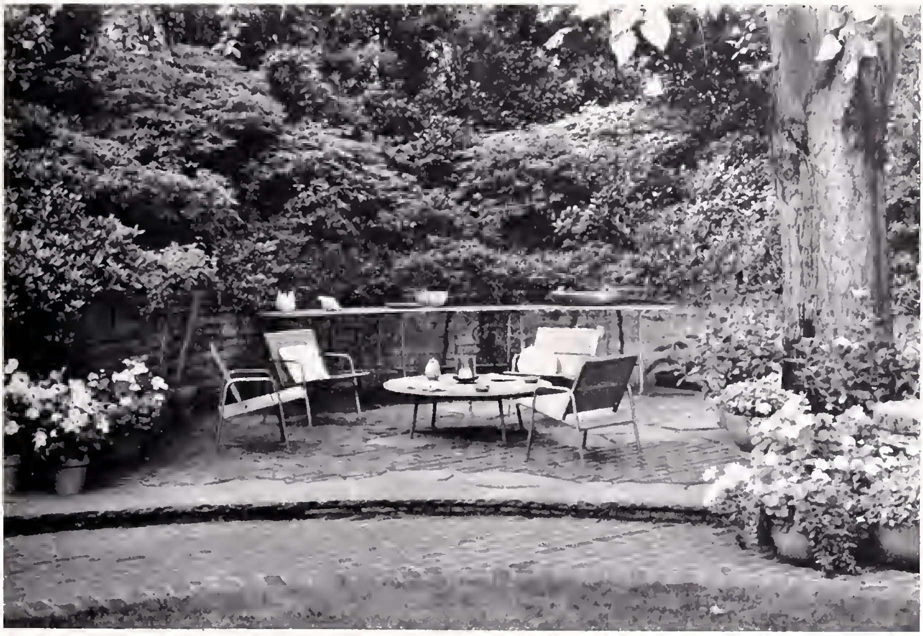
Dearborn-Masser photo
Courtesy House & Garden

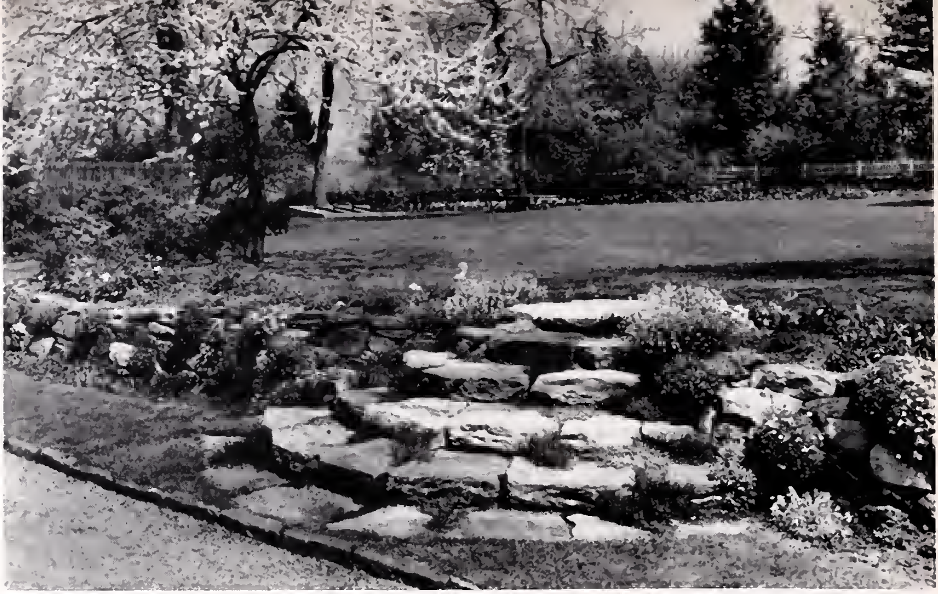
CONTRAST IN LINES. Irregularly shaped planting beds offer a change from the straight lines of this rectangular terrace. Potted plants on the foot-wide top of the brick wall are strategically placed.



Arthur W. Erfeldt, *Landscape Architect*

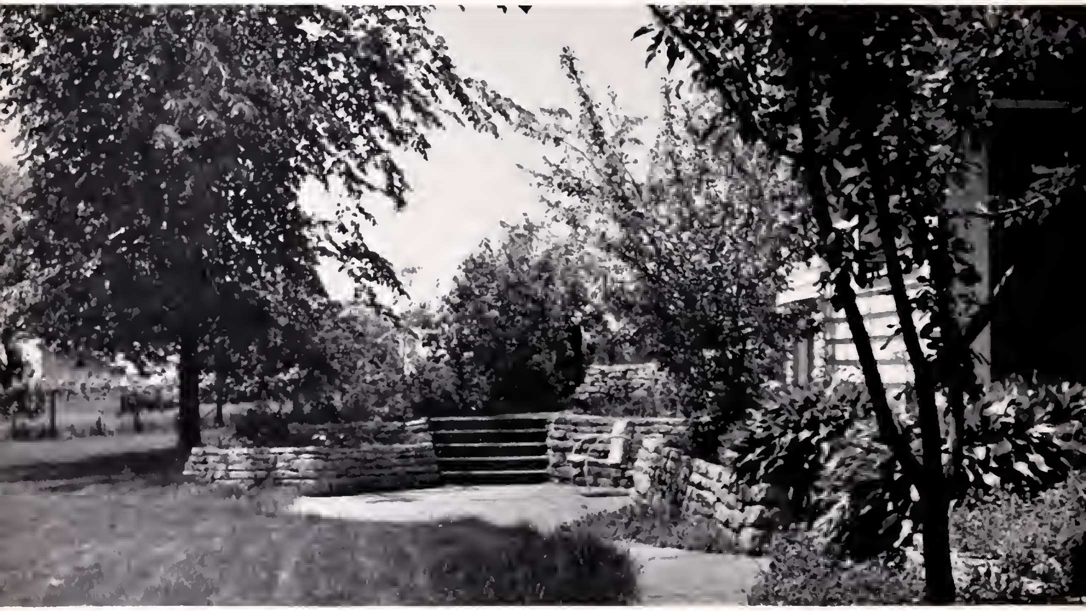
Jeannette Grossman photo

SECLUSION FROM TRAFFIC. Wall and background planting set this terrace off as a unit and hide it from a busy street. Masses of colorful potted plants can be replaced as the seasons advance. Flagstone, used with restraint, breaks the monotony of the brick and clearly marks a change of elevation between terrace and walk.



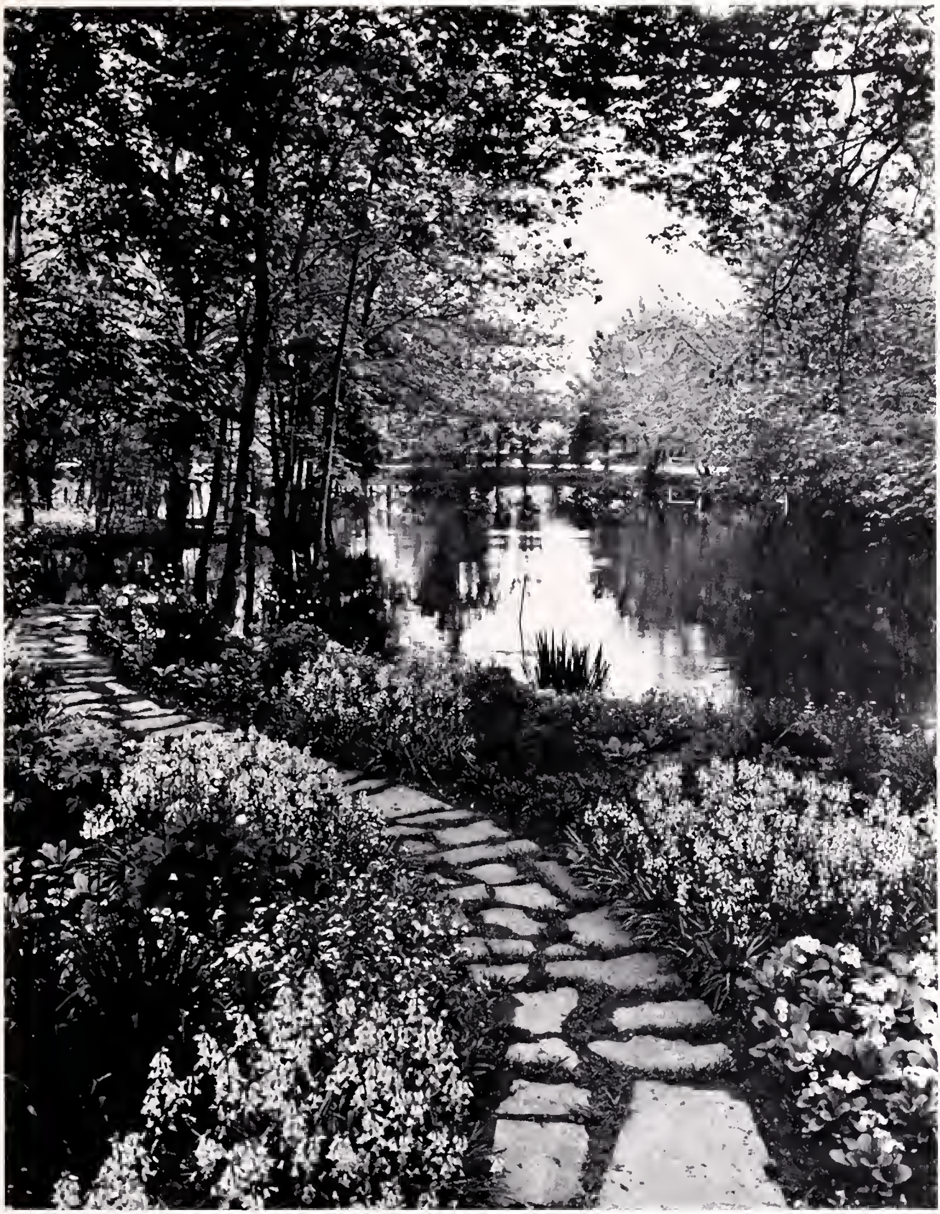
Mrs. H. I. Nicholas, *Landscape Designer* *Gottscho-Schleisner photo*

FOREGROUND PLANTING, BACKGROUND HEIGHT. A stone retaining wall built without mortar is excellent for alpine plants, which also grow between stones in the steps. In the distance, a picket fence stands atop another stone retaining wall.



Robert W. Dyas, *Landscape Architect* *Margherita Tarr photo*

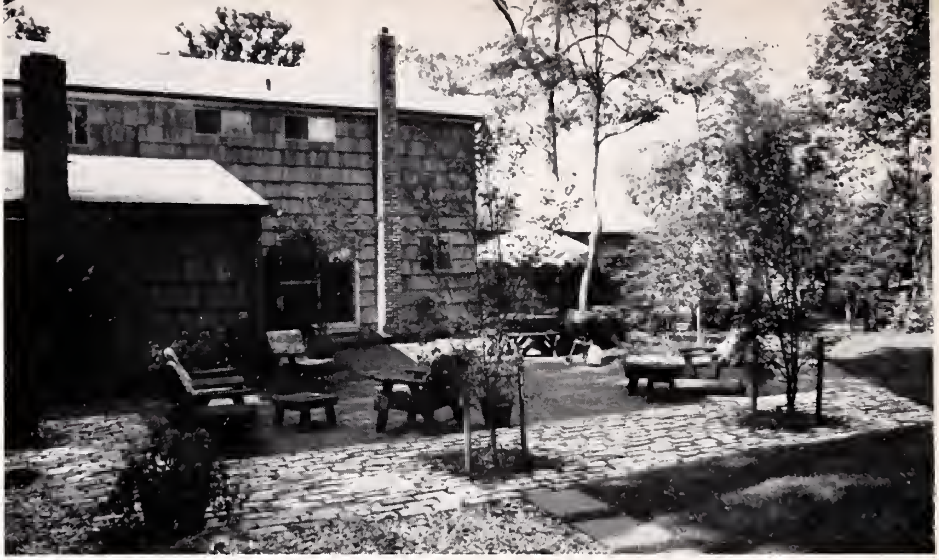
ON TWO LEVELS. Here a slight change of elevation is accentuated by retaining wall and steps, and the garden thus gains distinction. Use of native stone lends local character. A large area of plantain-lily (*Hosta*) marks an entrance to the house.



Gottscho-Schleisner photo

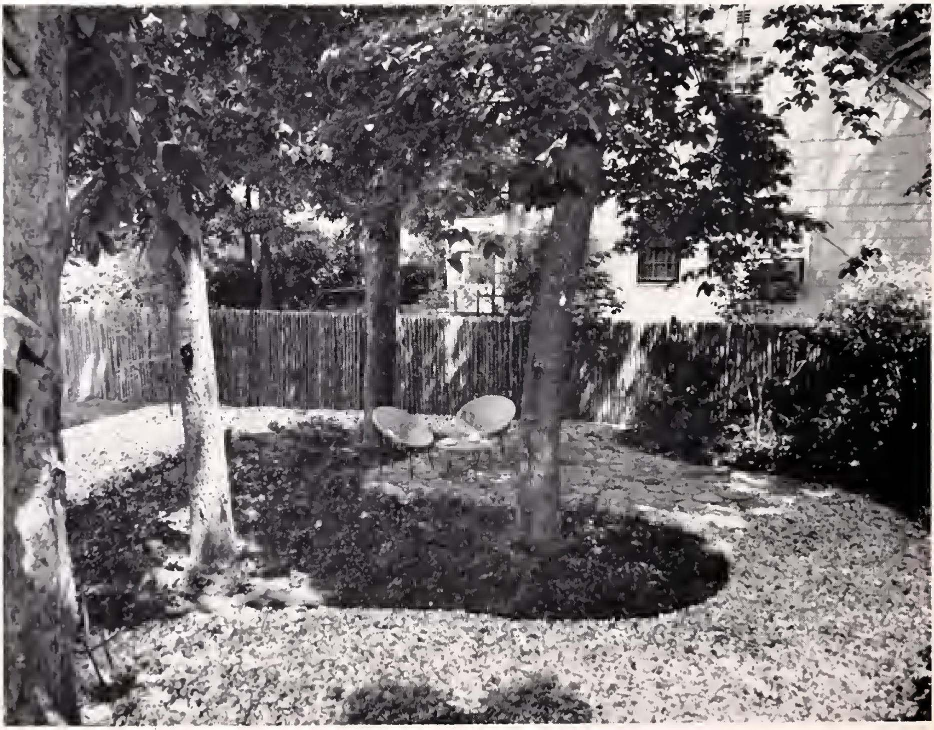
Mrs. H. I. Nicholas, *Landscape Designer*

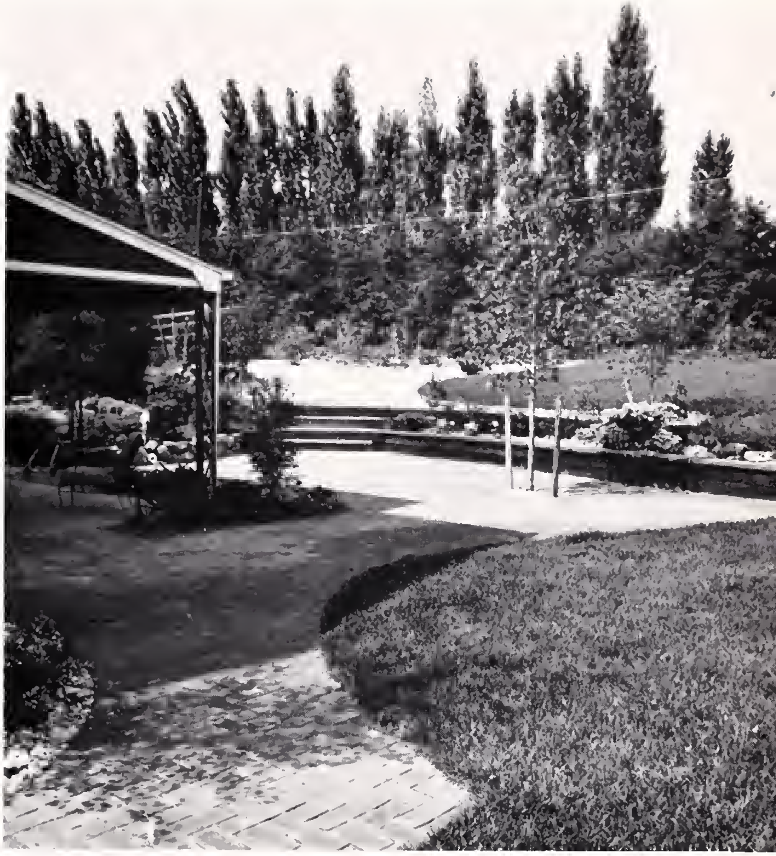
REFLECTIONS FOR ENHANCEMENT. Trees along the pond's edge do double duty when reflected in the open water. Among the masses of spring flowers are sufficient numbers of Spanish squill *(Scilla campanulata)* to complement the warmer colors of primroses *(Primula* varieties) and globe-flowers *(Trollius europaeus).* The foliage of Japanese iris *(Iris kaempferi* varieties) gives a strong silhouette against the water.



Goldberg & Rodler, *Landscape Designers* *Mal Gurian photos*

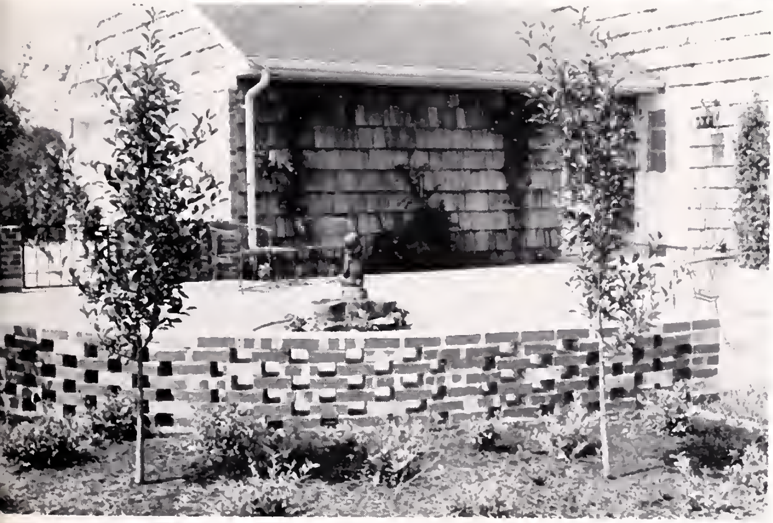
LOW MAINTENANCE. Gardens that require little work attract increasing interest. *Above:* Paved terrace with sun and shade provides outdoor living space and reduces lawn care. *Below:* Area in pebbles and wafers of wood (locust or redwood for lasting quality) takes the place of grass. The large central mat of English ivy, once established, requires little attention. The canopy of tree foliage obviates possible glare from light-colored stones. Trees and fence here provide privacy. The combination of both sunny and shaded areas makes both these outdoor living areas useful any time of day and in almost any season.





DEFINITION OF AREAS. A small planting marks corner of covered part of terrace, and raised beds separate paved area from higher ground beyond. One can easily move from shade to sun in this outdoor living area. A high background is gained here by the use of Lombardy poplars.

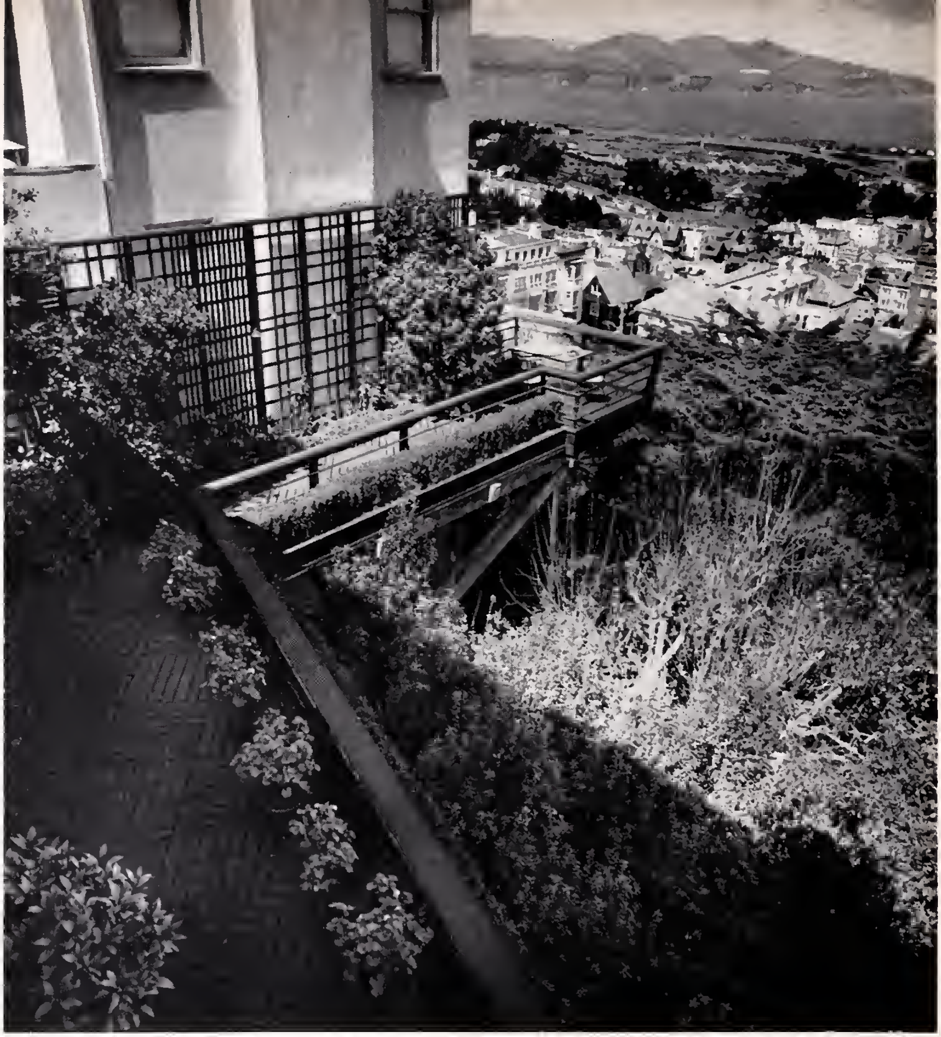
Goldberg & Rodler,
Landscape Designers
Mal Gurian photo



DOUBLE USEFULNESS. Garage wall becomes a garden wall, with clematis and espaliered pyracantha planted against it. An openwork brick wall demarks the terrace and is so placed as to extend the lines of the building. Planting in foreground will further embellish the terrace in a few years.

Alice Upham Smith,
Landscape Designer

Vivian Hansbrough photo



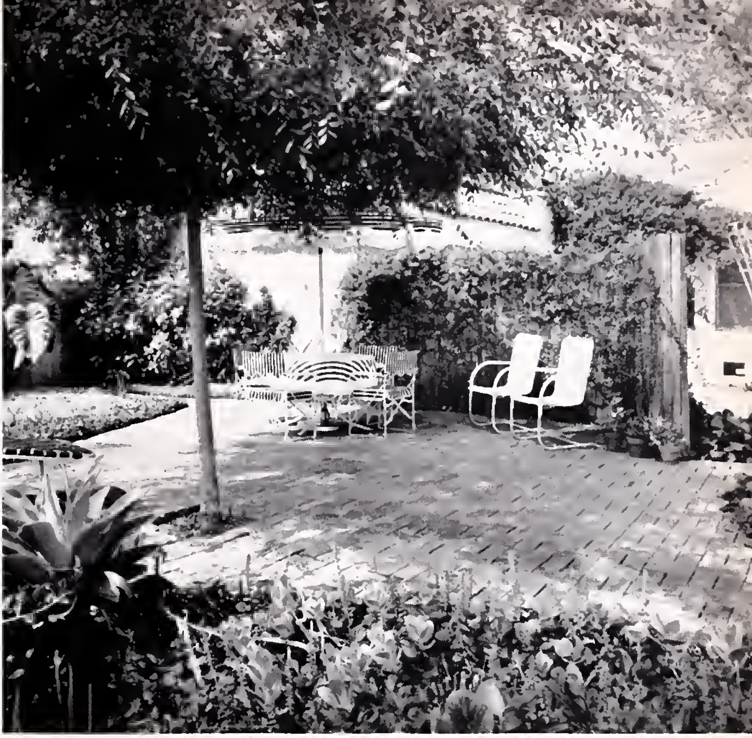
Thomas D. Church, *Landscape Architect* *Maynard L. Parker photo*

BORROWED SCENERY. Where there is no level ground for gardening, a timber deck can simulate a garden setting. Potted geraniums and occasional tubbed specimens of broad-leaved evergreens are used here. Just below far corner of deck, flat-topped Monterey cypress *(Cupressus macrocarpa)* obscures rooftops in immediate foreground. Distant mountains and the large expanse of water, as borrowed scenery, give this deck garden a dramatic quality.

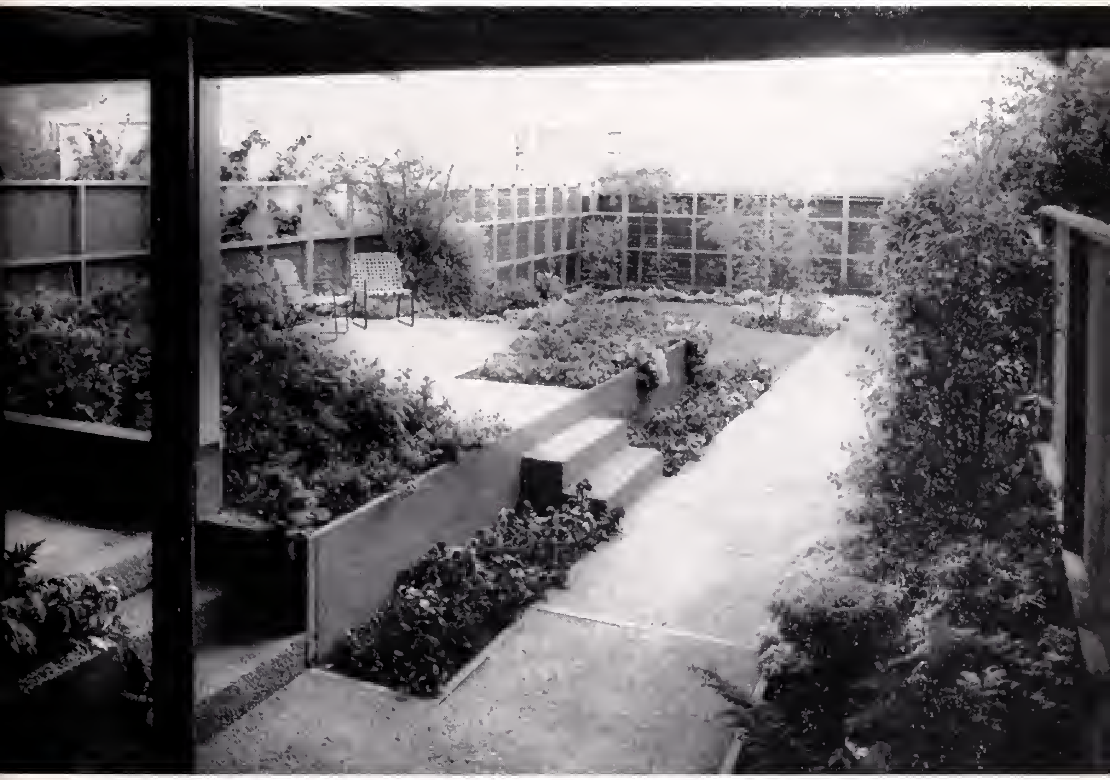
> "The new kind of garden is still supposed to be looked at. But that is no longer its only function. It is designed primarily for living as an adjunct to the functions of the house. . . . The garden has to go to work for us, solving our living problems while it also pleases our eyes and our emotional and psychological needs."
>
> Thomas D. Church
> *House Beautiful,* October, 1952

EFFECTS WITH FOLIAGE. In this composition a tree planted in a large paved area provides both shade and shadow pattern; vines successfully soften the vertical lines of a fence. Large-leaved plants, used with restraint, add exotic interest. ►

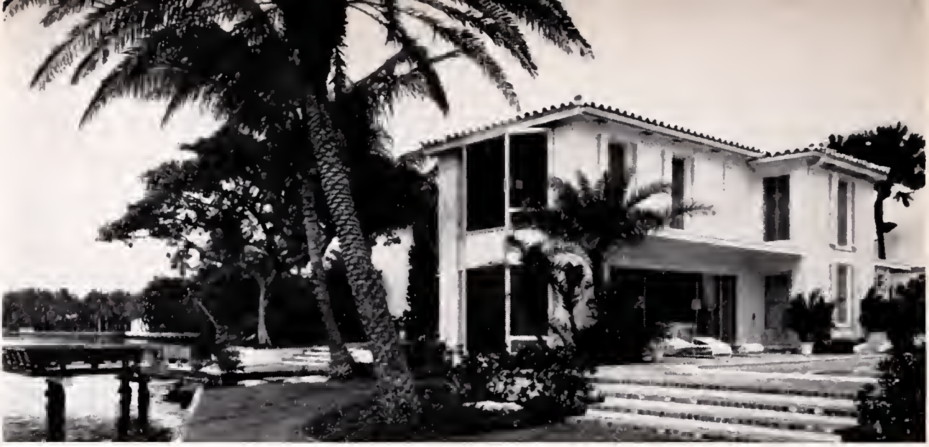
SPACE UTILIZATION. Variation of level gives the feeling of two gardens against a single background. A look-through fence provides a good view of a specially trained vine on an adjoining building—giving the effect of greater space. ▼



Peggy Sullivan, *Landscape Architect* *Julius Shulman photo*



Thomas D. Church, *Landscape Architect* *Maynard L. Parker photo*

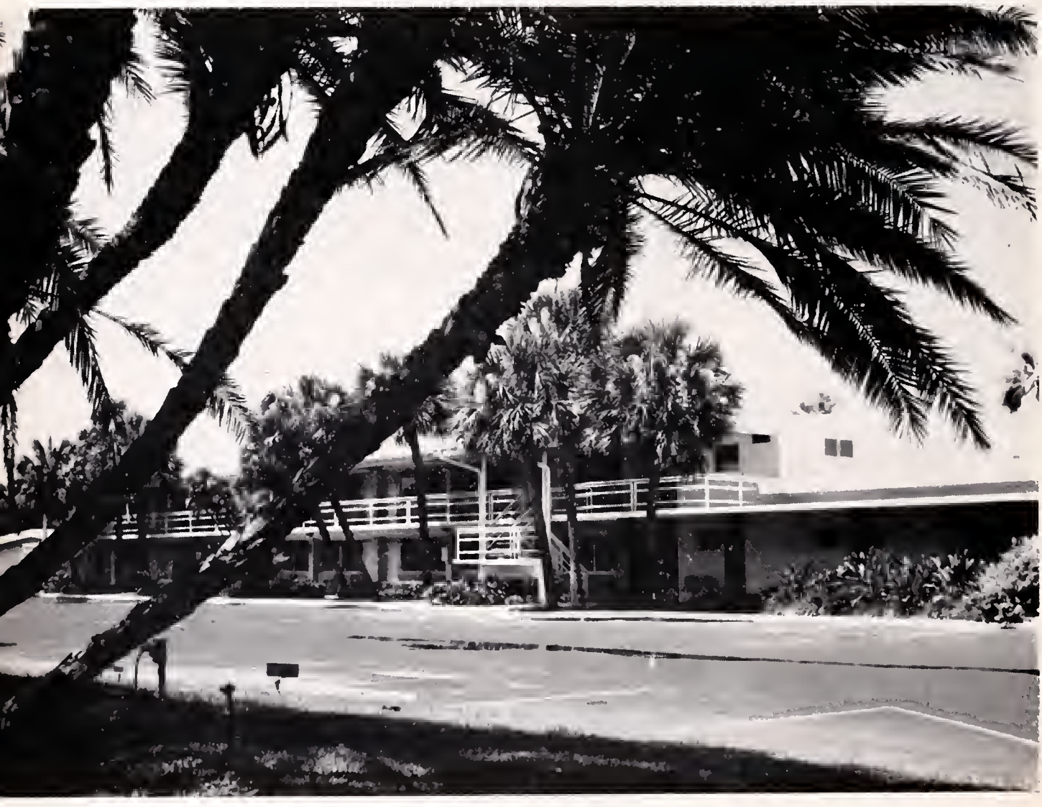


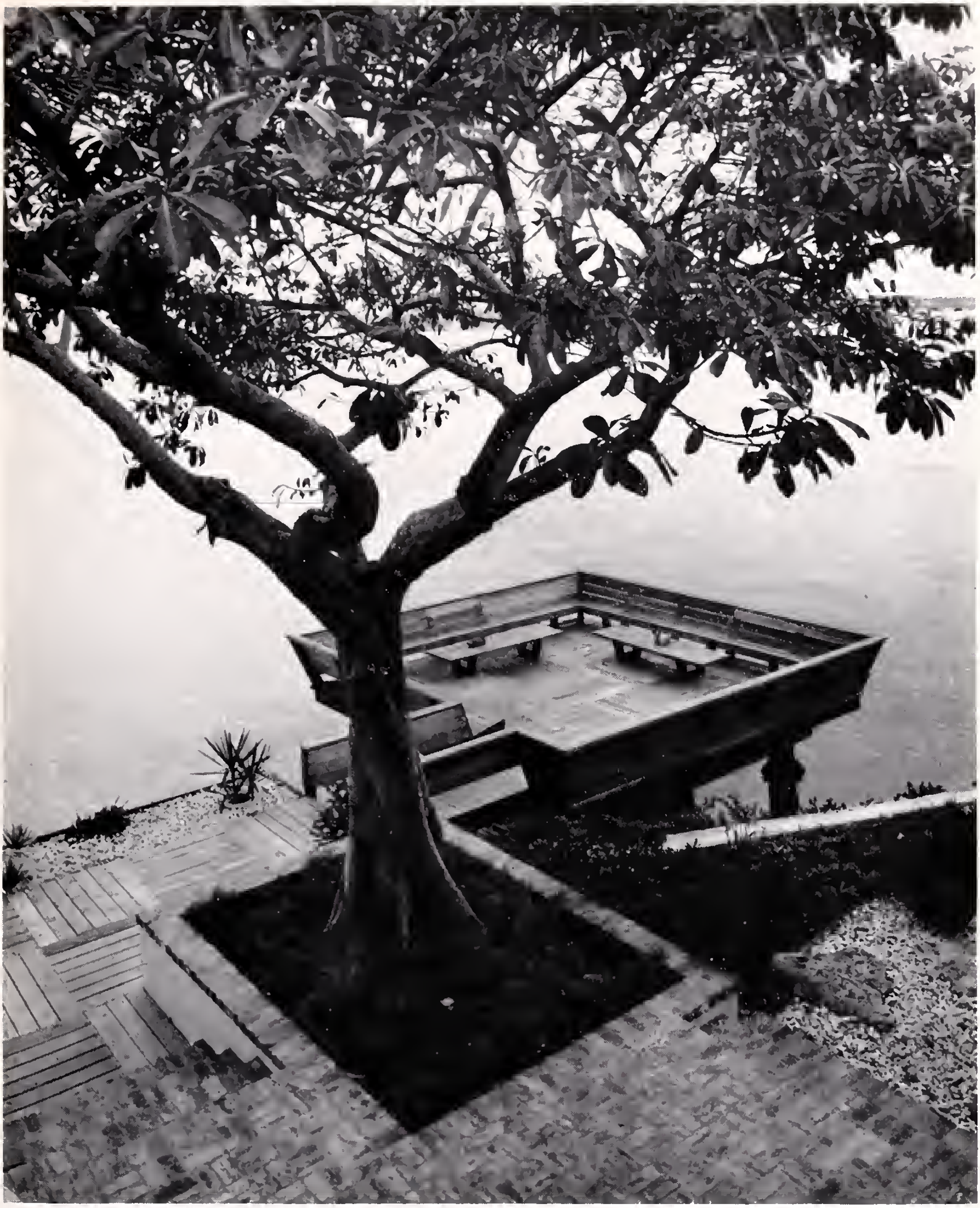
Edward D. Stone, Jr., *Landscape Architect* *Ron Davis photo*

SENSE OF COMFORT. Wide steps with low risers give a feeling of ease—a distinguishing mark in any well-designed garden. Here, simplicity of design, with few plants, reflects tasteful planning. The wide flight of steps and the horizontal lines of the house contrast effectively with the strong yet lacy pattern of the palm tree.

DRAMATIC EFFECTS. Palms with their tremendous fronds and unbranched trunks are dramatic assets to the architecture of tropical and near-tropical regions. Note the sweeping lines of the multiple-stemmed palm *(Phoenix reclinata)* in the foreground.

Jack O. Holmes, *Landscape Designer* *Lewis Ellsworth photo*





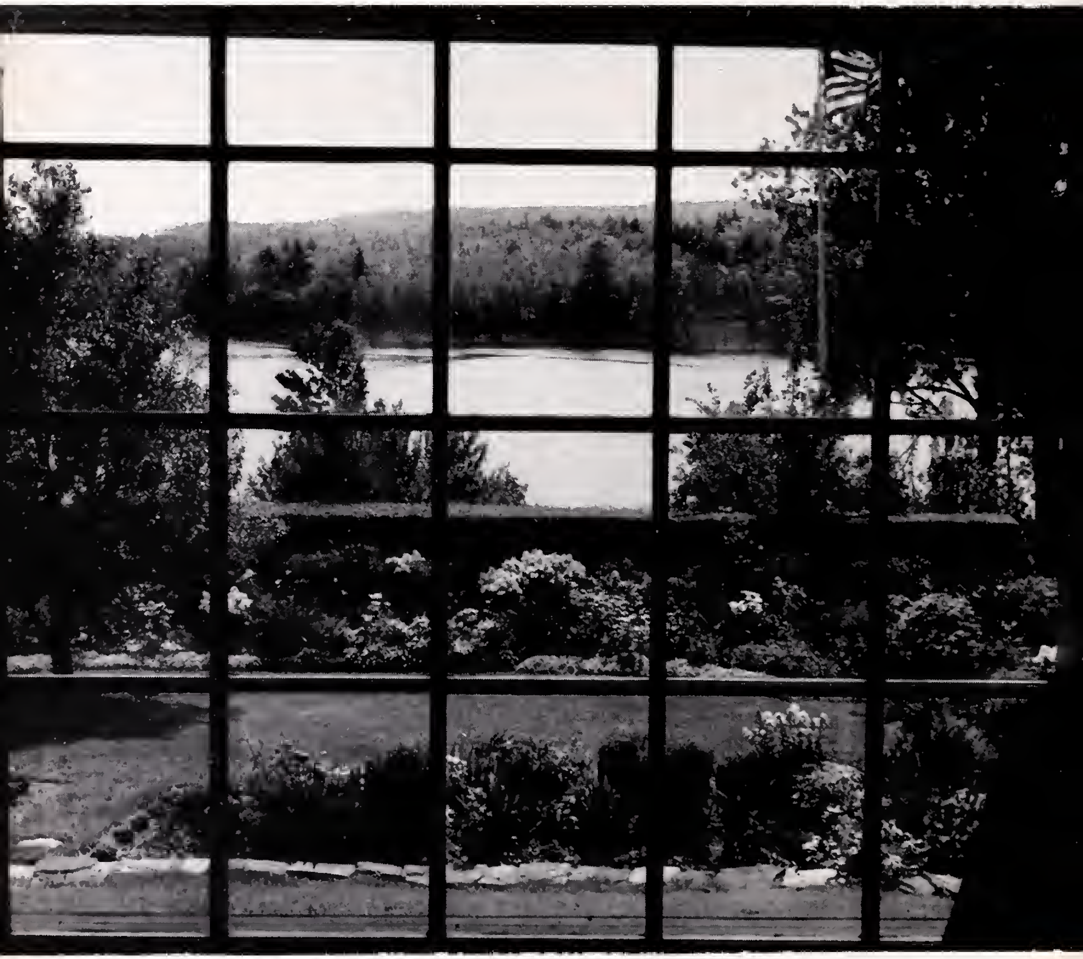
Ron Davis photo

Edward D. Stone, Jr., *Landscape Architect*

SCULPTURAL LINES. The tree above this terrace platform over the water has been carefully selected and pruned to reveal its artistic branch structure.

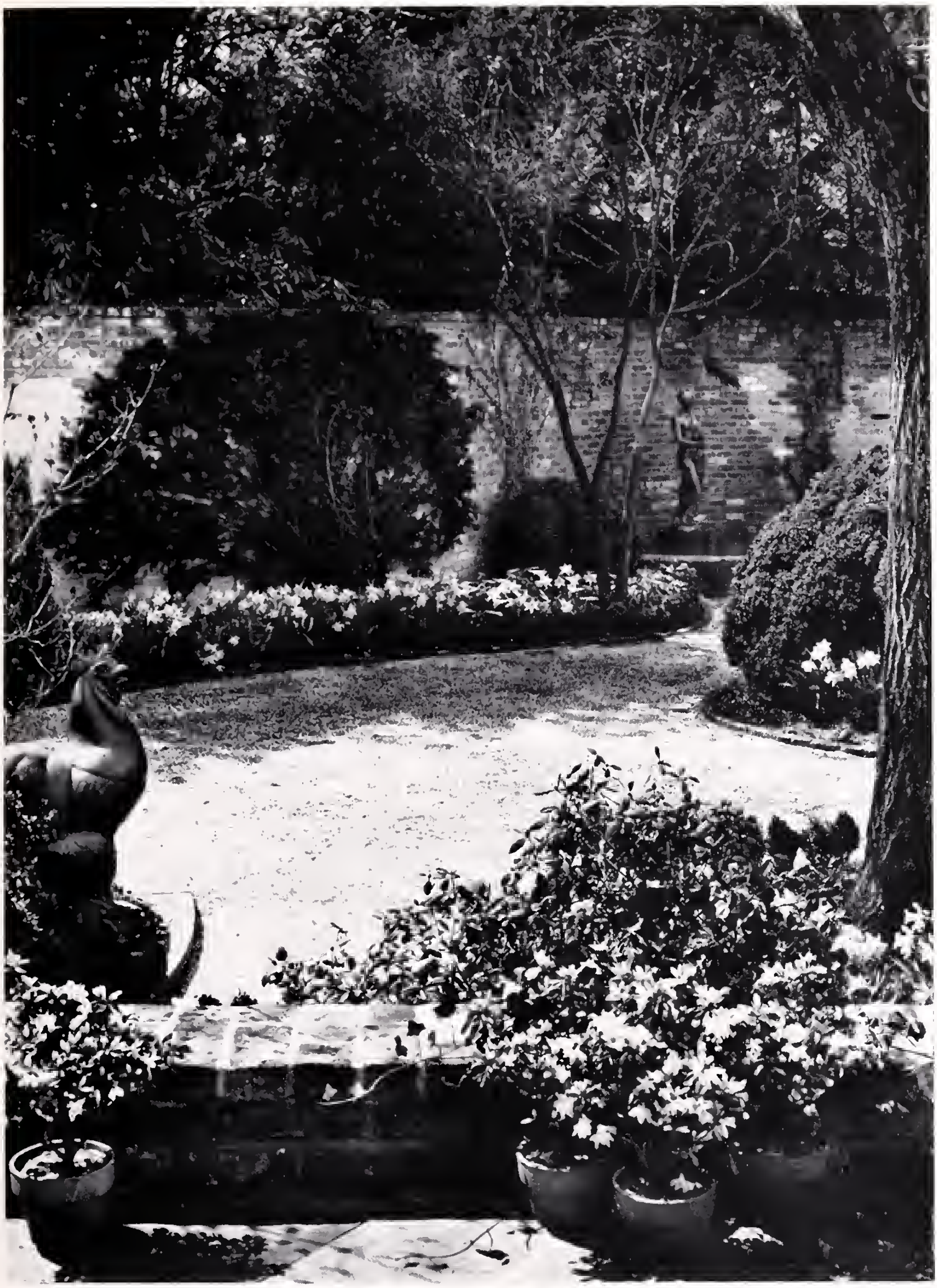
GARDENS FOR VIEWING

> "Home landscape design is the art of using outdoor space with imagination. By means of landscape design, we define the land which surrounds our homes; we create views and vistas; we set patterns of land use which will be both beautiful and functional."
>
> Eugene Martini in
> *Better Homes & Gardens Landscape Planning*
> Meredith Publishing Company, Des Moines, 1963



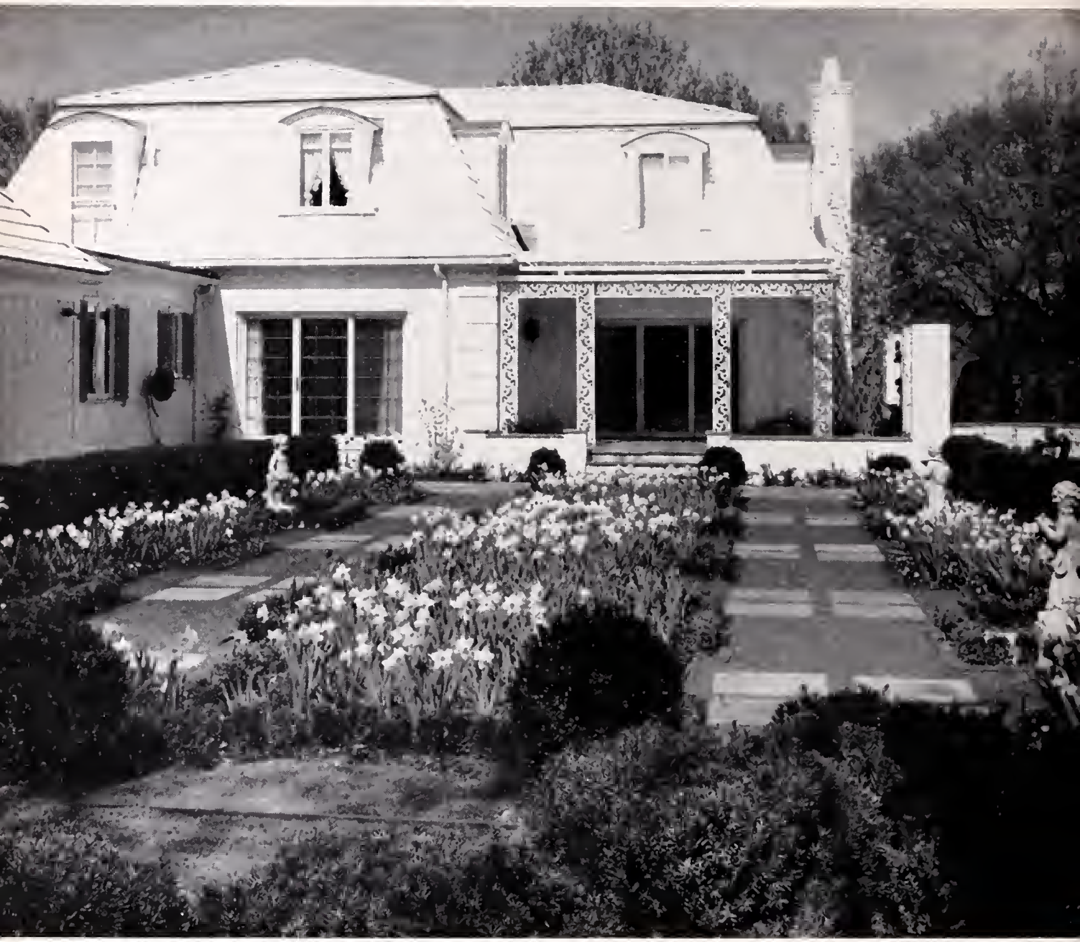
Mrs. Harold Morse, *Designer* — *J. P. Roche photo*

PROSPECT FROM INDOORS. Where nature provides a scenic backdrop, the garden should be of simple design. Good view of flowering borders from house more than doubles the pleasure of having a garden.



Innocenti & Webel, *Landscape Architects* *Gottscho-Schleisner photo*

WITHIN A WALLED GARDEN. Viewed from the terrace, the sweeping curved lines of the flower borders give grace to the enclosure. A large billowy boxwood (balanced by an espaliered yew) conceals a portion of the planting, tempting one to see what lies beyond. Seasonal flowers, replaced as each kind goes out of bloom, add color to the narrow planting area.

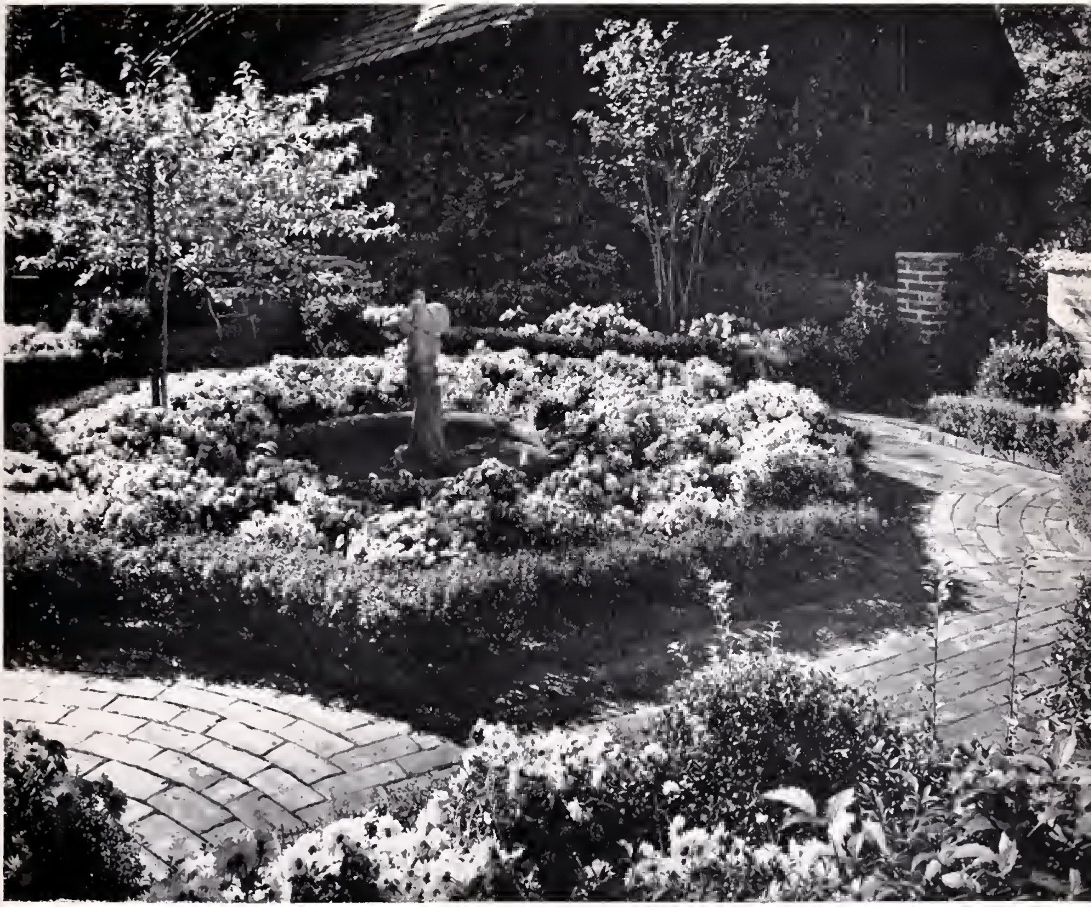


Ethelbert E. Furlong, *Landscape Architect* *J. P. Roche photo*

HARMONY IN ARCHITECTURE. An old-worldliness characterizes this garden setting. The design is crisp and in good relationship to the house. Planting, walk pattern, and sculpture are used in such a way that the garden has interest at all times of the year. Restrictive pruning of dwarf boxwood and yew is done to keep these plants in scale with the garden. Daffodils can be followed by colorful bedding plants—annuals and tender perennials.

> "A garden is a work of art. It is also a number of other things, such as a place for rest and recreation, and for the pursuit of horticulture, but to be a garden in the true sense of the term it must first be an aesthetic composition."
>
> Christopher Tunnard: *Gardens in the Modern Landscape*
> Charles Scribner's Sons, New York, 1950

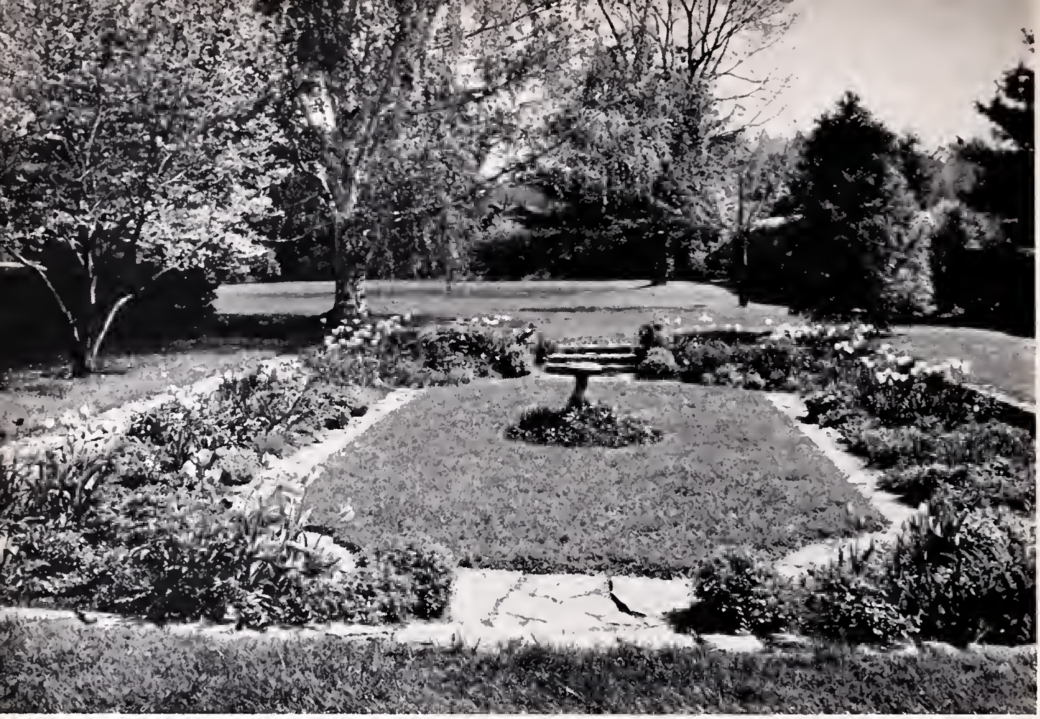
> "There is a simple balance in all good design between mass and void, without which the garden cannot succeed as a whole. This means thinking and designing in forms and volumes which will interlock and balance automatically. Design by line and plan alone seldom produces a successful whole."
>
> Desmond Muirhead: *Green Days in Garden and Landscape*
> Miramar Publishing Company, Los Angeles, 1961



Gottscho-Schleisner photo

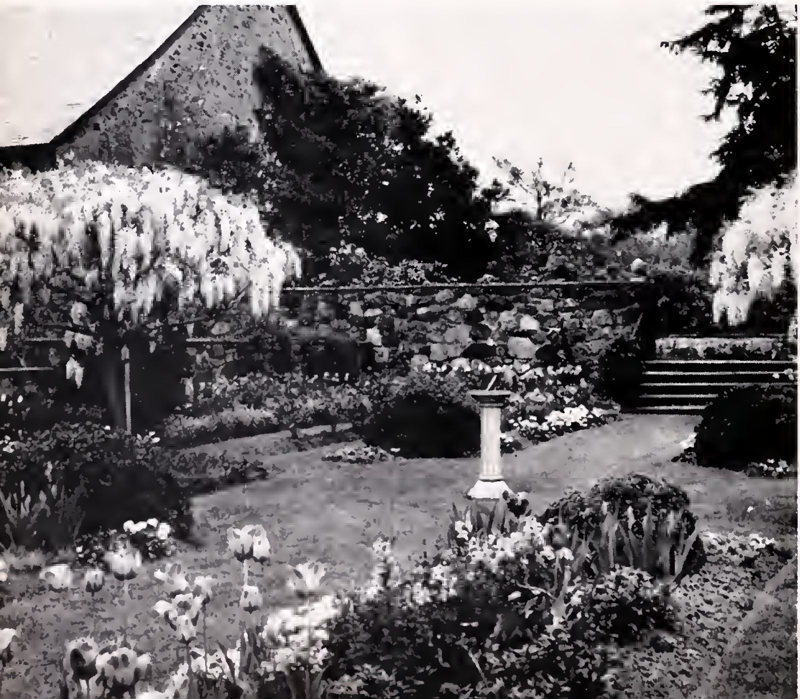
Innocenti & Webel, *Landscape Architects*

DESIGN WITH EMPHASIS. Brick edging and low hedge sharpen the pattern of this densely planted garden. The curved lines of the brickwork in the walk give further emphasis to the design.



Gottscho-Schleisner photo

EMPHASIS IN STONE. Flagstone walk inside this sunken panel garden accentuates the design and complements the outer retaining wall. The cutleaf weeping birch is a noteworthy feature. A mixed flower border of bulbs, perennials and annuals, with a few chrysanthemums added in the fall, gives a long season of bloom. A garden like this could be established in an area 20 by 30 feet if only the central portion were used.



BALANCED DESIGN. Wisteria vines, staked and pruned as standards, or "trees," strike a distinctive note in this springtime garden scene. Geometrically placed, they establish balance in the garden. The sundial used along the main axis marks a point of pause and directs one's attention to other features.

Courtesy
House & Garden
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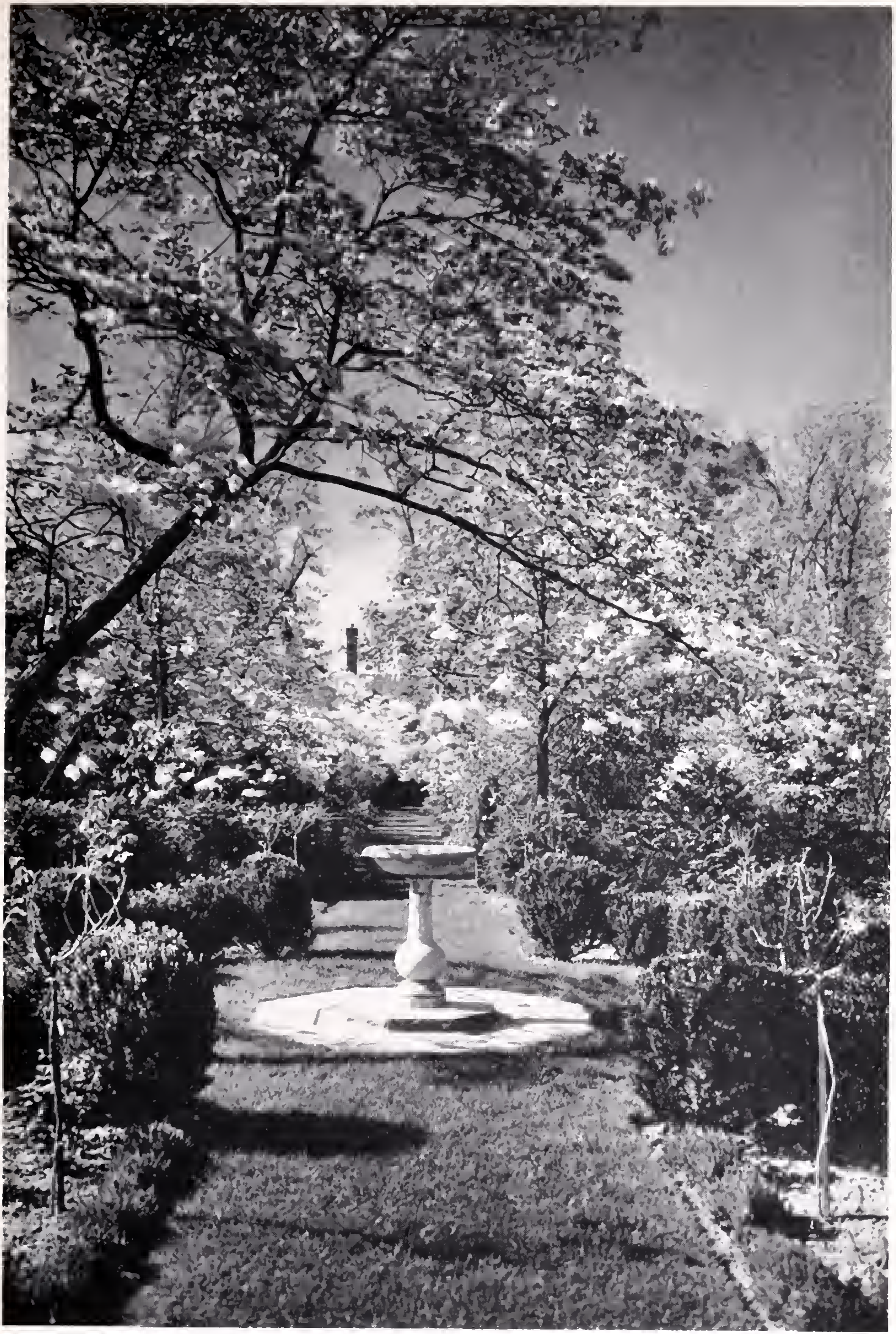
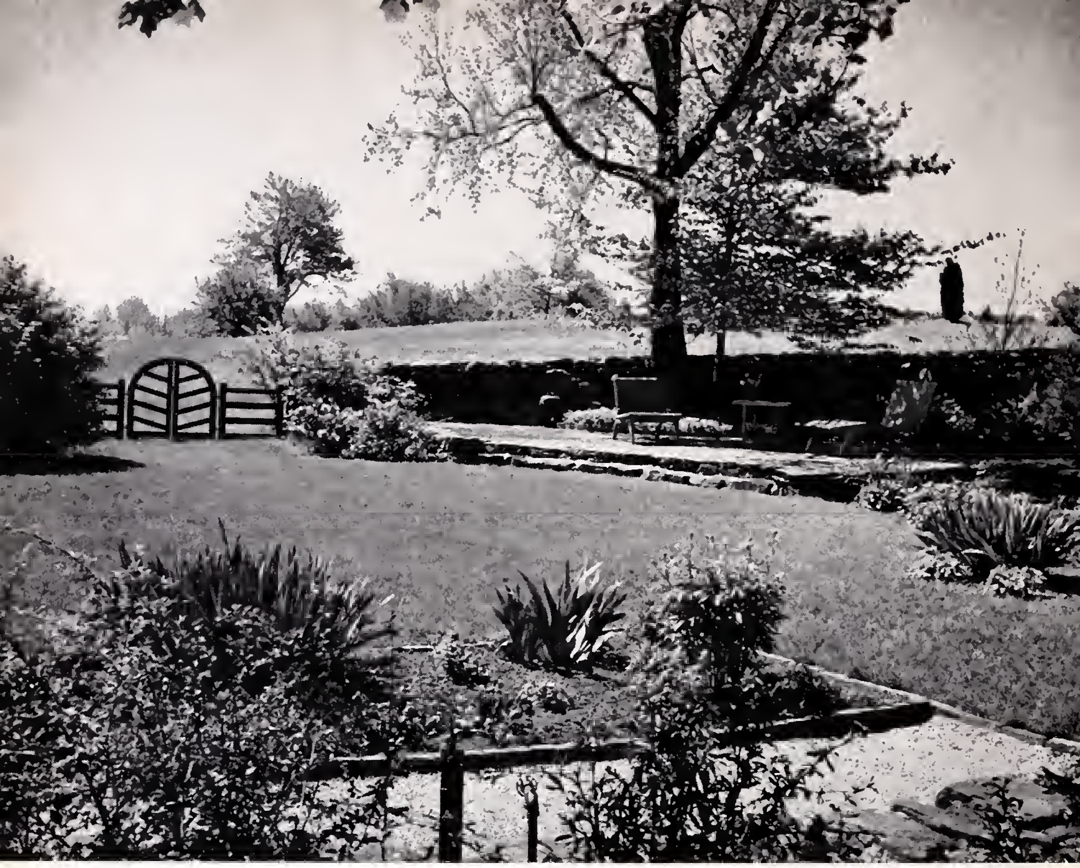


Innocenti & Webel, *Landscape Architects* *Gottscho-Schleisner photo*

DOMINANT CENTRAL FEATURE. Paving around pedestal gives a strong base to bird bath, sundial or other central feature, allowing it to stand out from the surrounding plants. The arched branch of a flowering tree frames the vista.



Mary Deputy Cattell, *Landscape Architect* — *Courtesy* House & Garden

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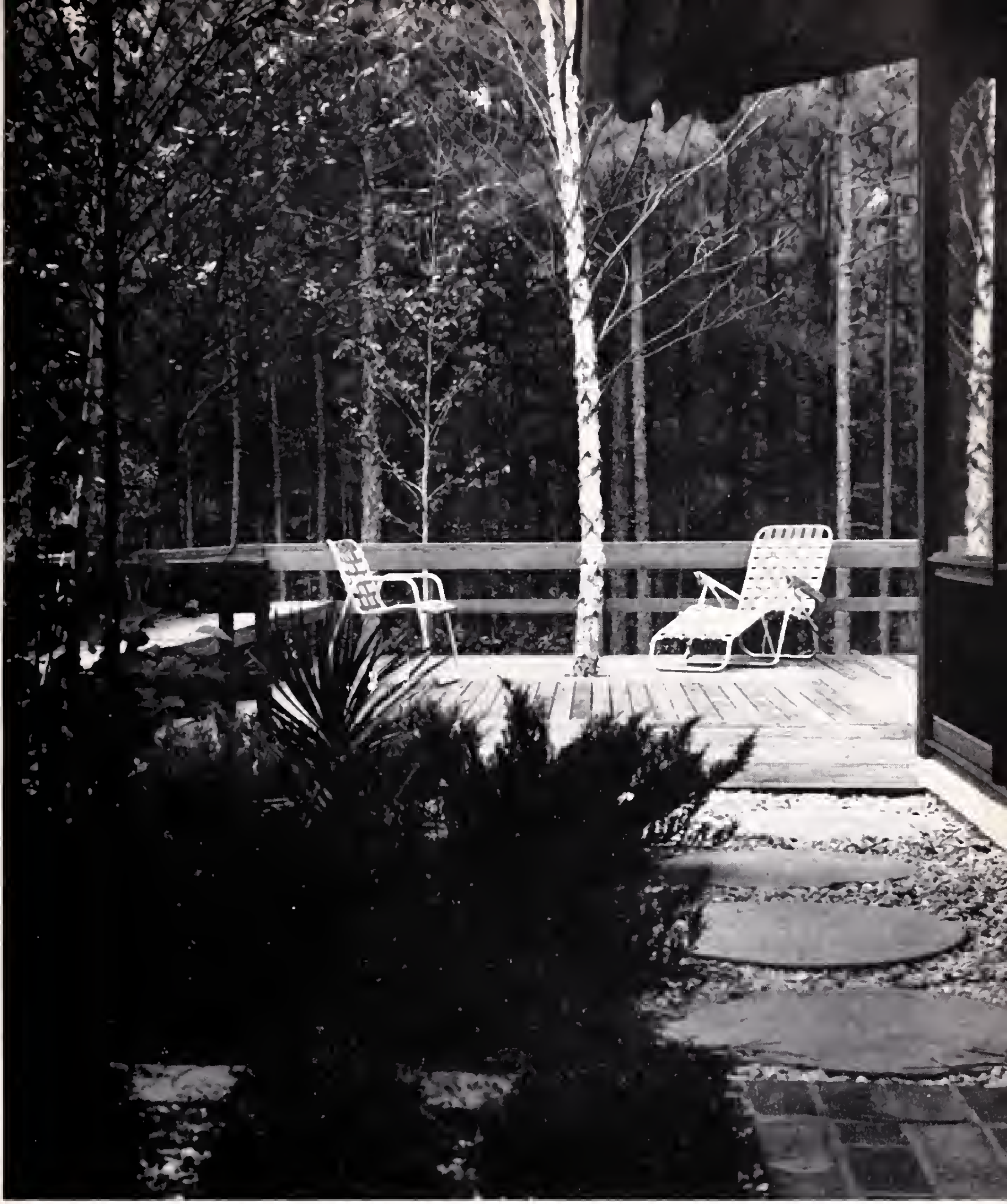
FOR LEISURELY MAINTENANCE. Carefree garden in a pleasant rural setting induces relaxation. Tree and terrace, both large, are in keeping with the broad sweep of meadowland. The grass field, if cut twice a year, will remain free of brush. The gate, of distinctive design, is appropriately informal.

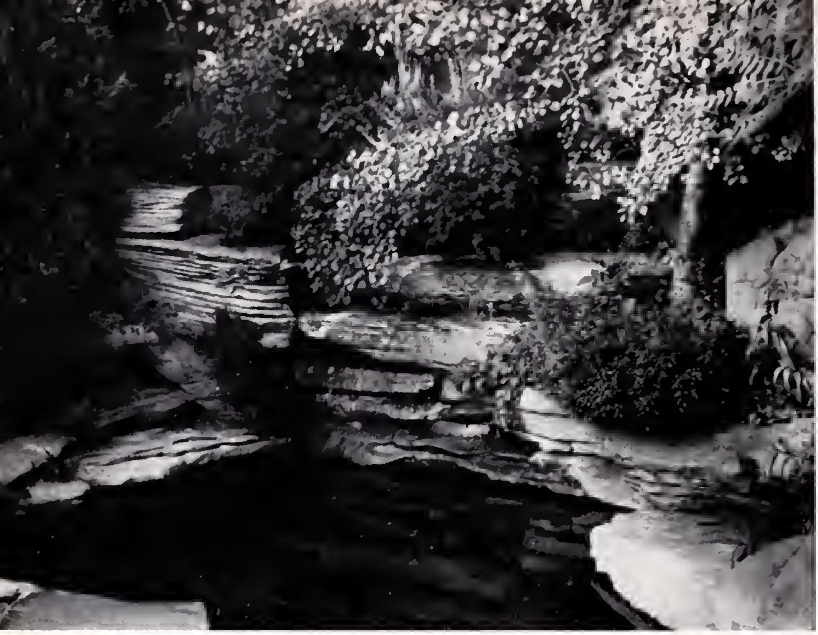
Mary Deputy Cattell, *Landscape Architect* — *Gottscho-Schleisner photo*



Lewis Clarke, *Landscape Architect*

NATURAL BACKDROP. House on edge of pine woods. Low planting of pebble-mulched evergreens at left, open deck beyond. Walk of brick and large stepping stones.

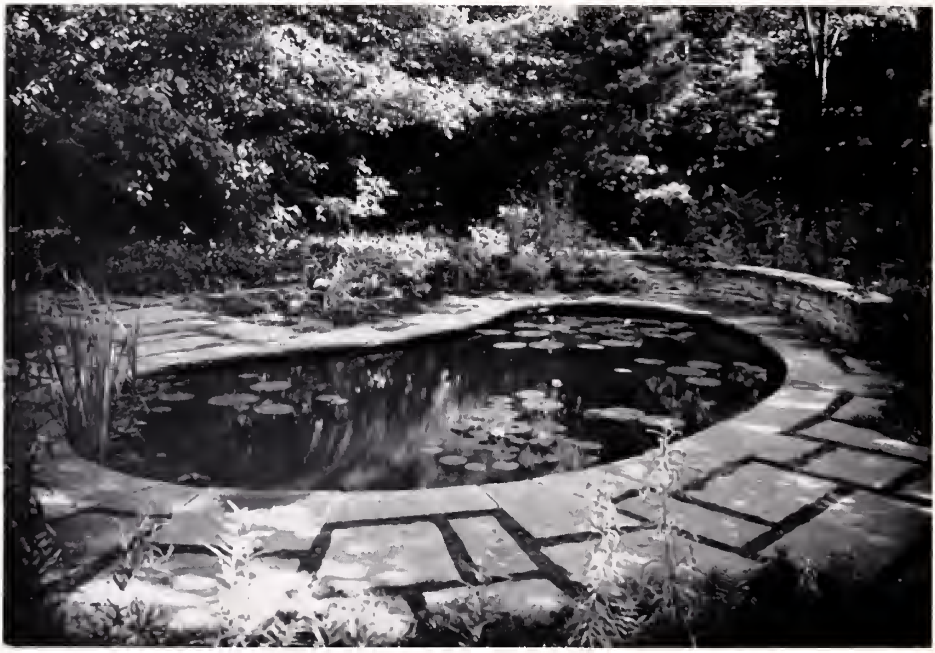
◄ *GARDEN-TO-WOODLAND TRANSITION.* Flower beds with flowing path lines merge easily into the natural woodland background, which is supplemented with understory planting. Instead of flowers, which need replacing several times a year, a green garden could be established in the brick-edged beds. Low foliage plants would contrast with the light-colored pebble path.



STONE STRUCTURE FOR POND. A few huge stones are better than a great number of small ones. A trickle of water over the ledge outcrop is more convincing than a heavy rush of water. A small pool looks larger if kept clear of vegetation. The water appears deeper if dark coloring is added to the concrete at the bottom.

Leon Frehner, *Landscape Architect*

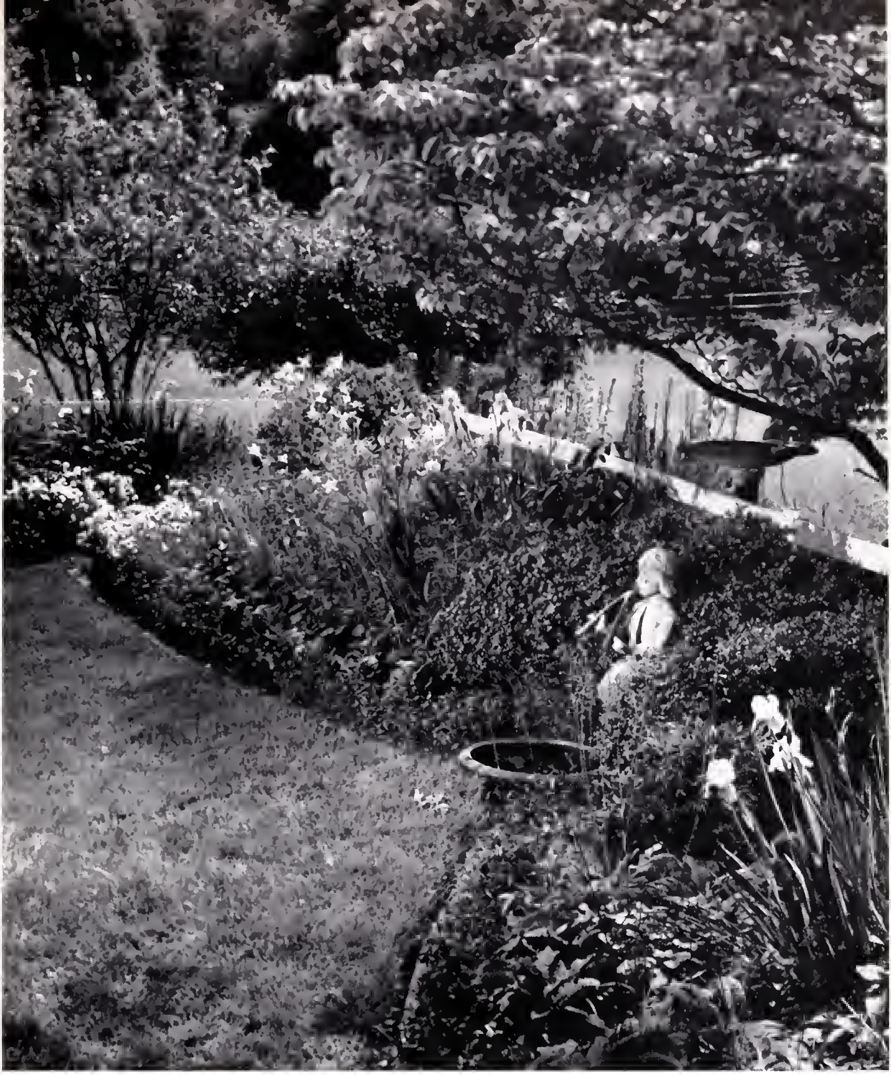
Gretchen Harshbarger photo



Eleanor Roche, *Landscape Architect*

Vera Angeline Bennett photo

HANDLING ORNAMENTAL AQUATICS. Water-lilies are placed in this large pool so open water will show. Growing them in boxes helps keep the water clean and simplifies drainage of the pool. A depth of 18 inches is suitable for such plants. Cat-tails at one end give needed height. Flagstones projecting 2 inches beyond the edge conceal the concrete understructure.



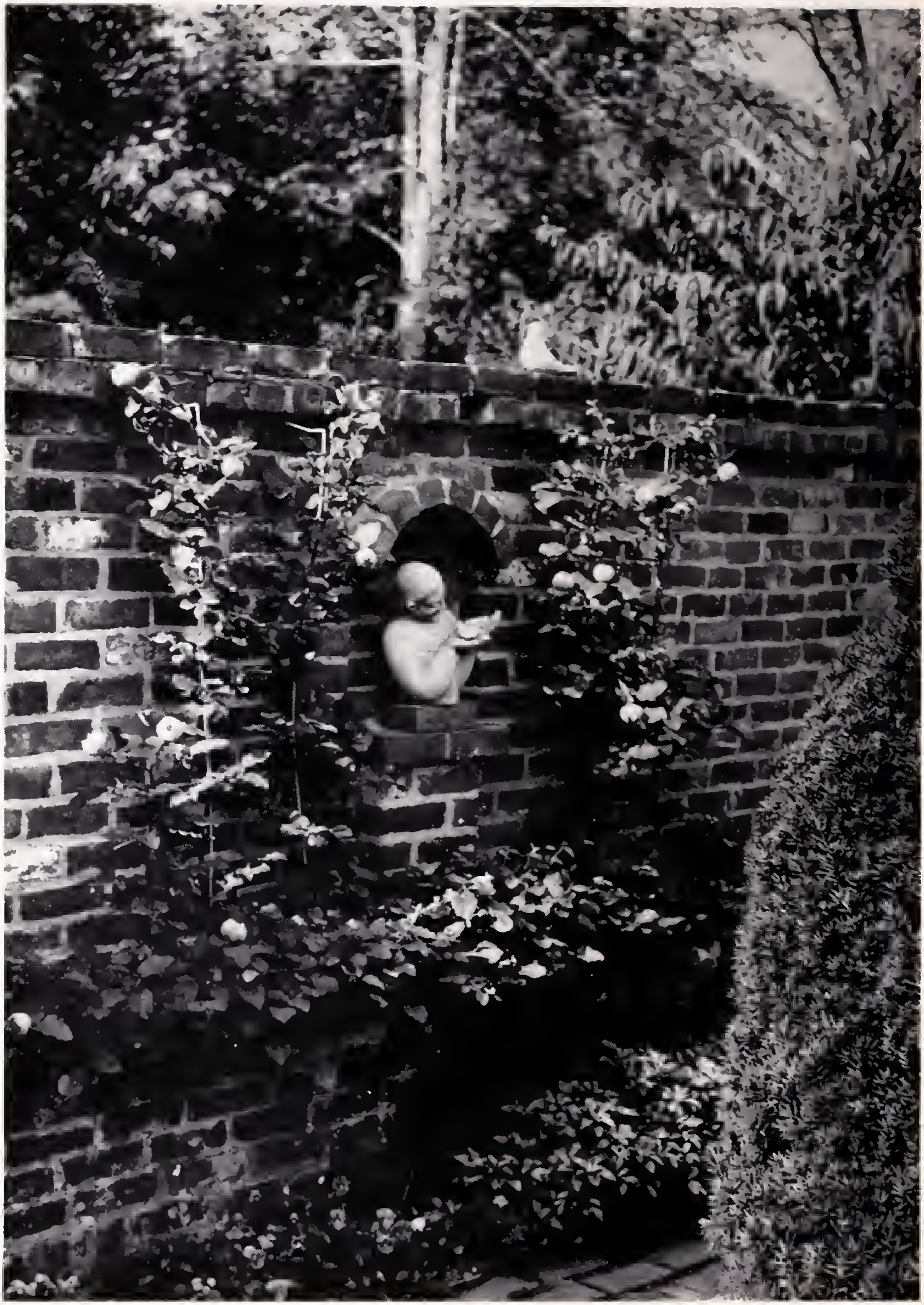
Gottscho-Schleisner photo

Mrs. H. I. Nicholas, *Landscape Designer*

SCULPTURE AS AN ACCESSORY. Fine-leaved azaleas provide an unobtrusive background for a small statue. Small figures can be made more effective in a design by the addition of some feature, such as a bird bath.

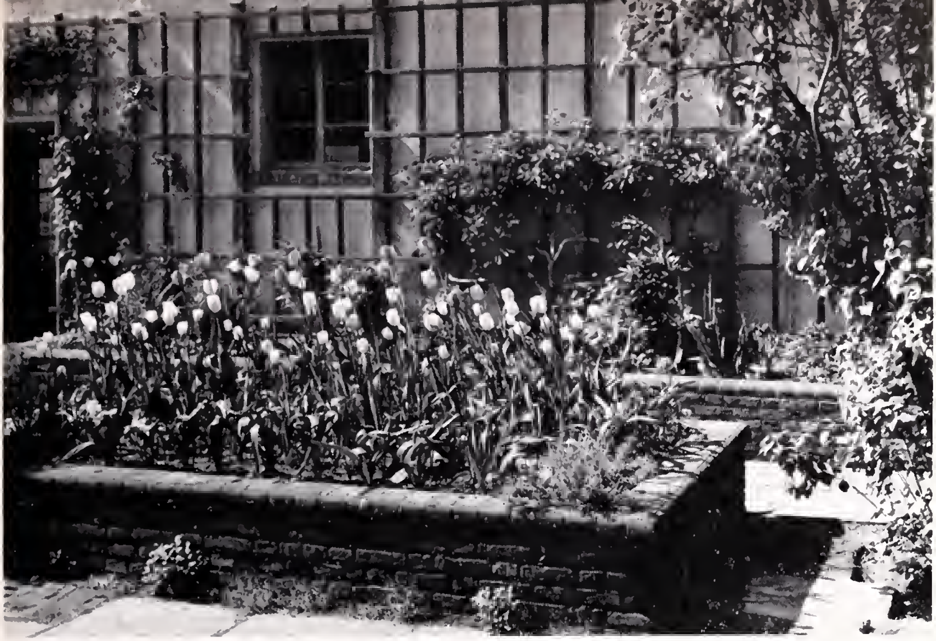
"Water is one of the great charms of the out of doors; it may also become one of the great expressions of city building on flat or level lands. It gives beauty and pleasure in a larger measure, perhaps than anything else in the out of doors can."

Jens Jensen in Leonard K. Eaton:
Landscape Artist in America—The Life and Work of Jens Jensen
University of Chicago Press, 1964



Dorothy R. Morris, *Landscape Architect* *H. H. Allen Morris photo*

SCULPTURE FEATURED. A small figure of St. Francis "framed" in a garden wall can bring delight to its viewers. The espaliered quince tree makes the sculpture niche an intrinsic part of the garden.

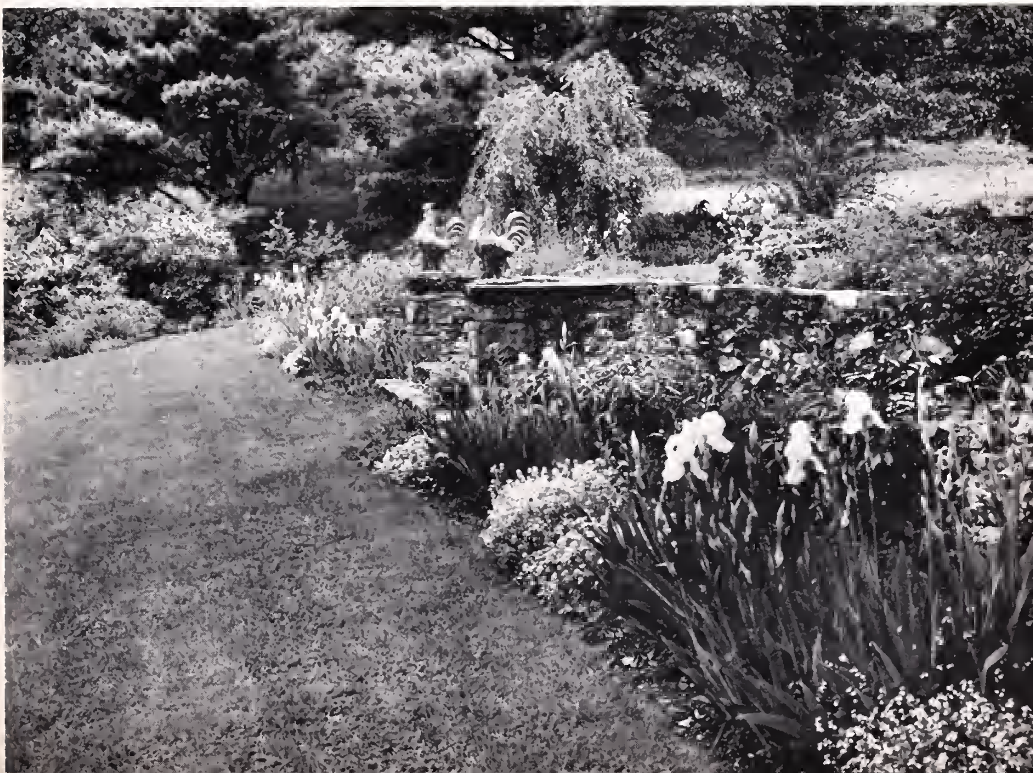


Mary Deputy Cattell, *Landscape Architect* *Gottscho-Schleisner photo*

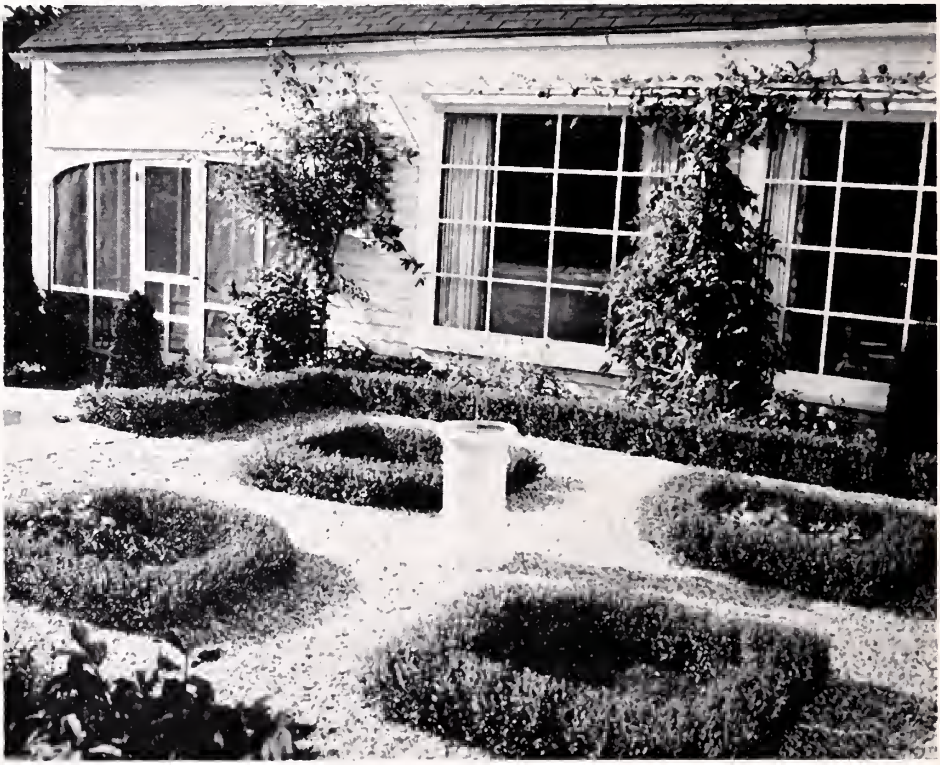
CONVENIENCE. Raised planting beds bring flowers nearer to the eye and nose level. The wall, low enough to sit on, makes for easier care. The trellis makes possible the growing of vines and espaliered fruit trees.

STRENGTH IN GARDEN DESIGN. The dominant stone steps with heavy side walls and the ceramic roosters give strength to this design. The wall is high enough to provide a backdrop for the flower border.

Mrs. Mortimer J. Fox, *Designer* *Gottscho-Schleisner photo*



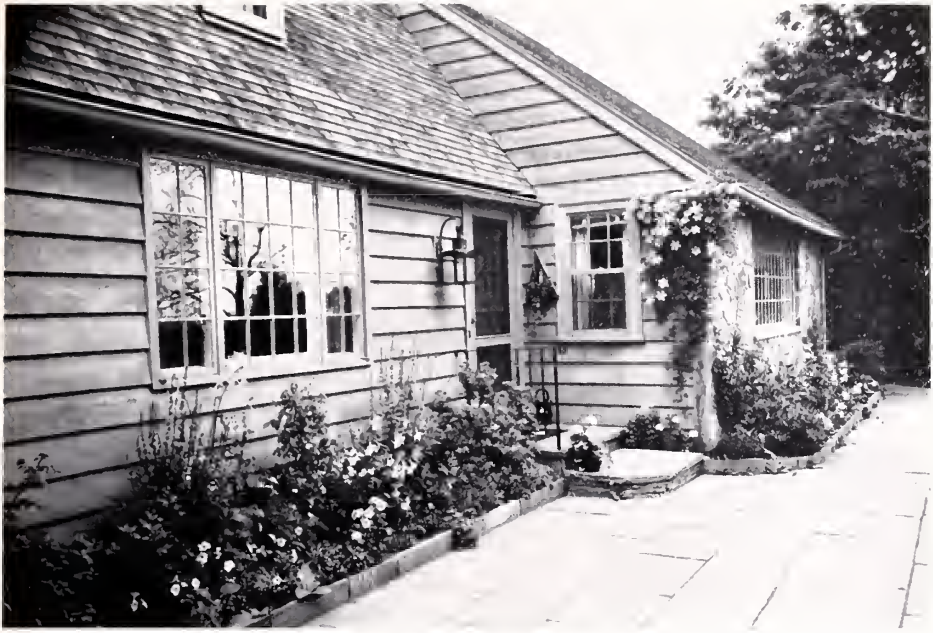
> "'Garden' is a word which means something different to everyone. To the horticulturist it is a place for growing plants; to the poet it suggests seclusion, rest, meditation, or perhaps gaiety; to the landscape architect it is a definite unit of design with certain aesthetic and utilitarian functions."
>
> John A. Grant and Carol L. Grant: *Garden Design Illustrated*
> University of Washington Press, Seattle, 1954



H. H. Allen Morris photo

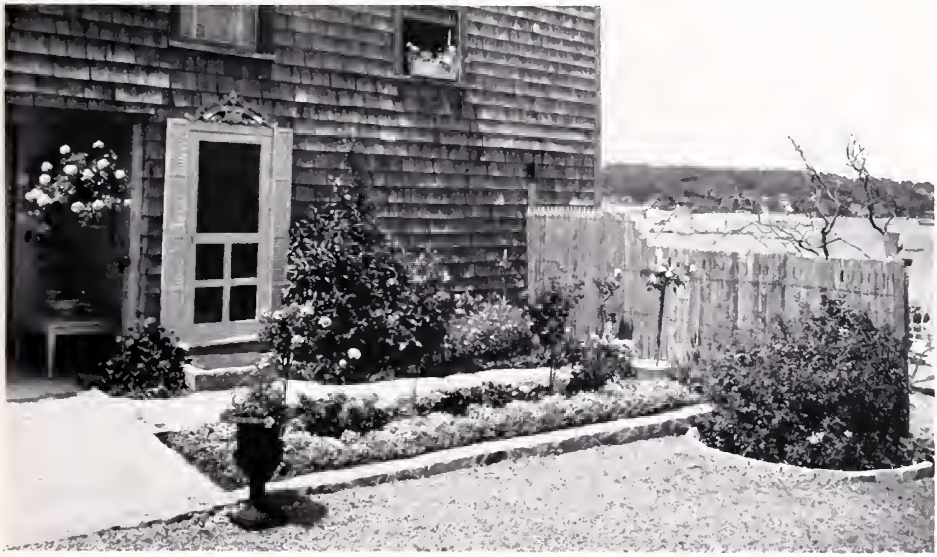
Dorothy R. Morris, *Landscape Architect*

MODIFIED FORMALITY. Germander *(Teucrium chamaedrys)* can be trimmed as a low hedge or edging plant, and is well suited to a small garden. The sundial provides the architectural feature that is essential to a formal plan. Trellis over windows permits the growing of vines.



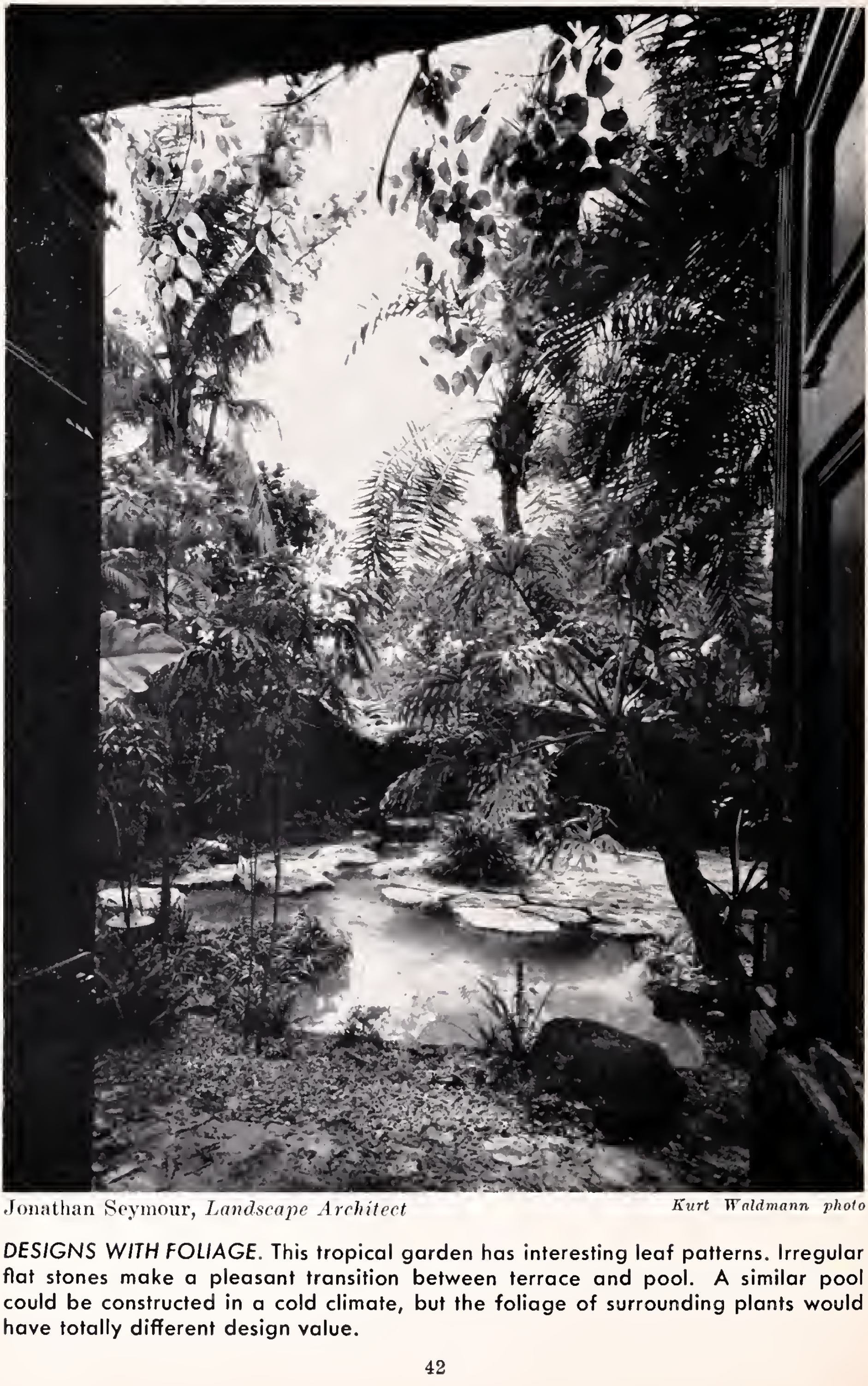
Mrs. Samuel Kirkwood, *Landscape Architect* *Paul E. Genereux photo*

COTTAGE-GARDEN STYLE. Clematis softens the corner of the house and the flower border is kept in bounds by an edging of bluestone. Japanese pieris (often miscalled andromeda) *(Pieris japonica)* is used near the doorway, but the foundation planting is treated in cottage-garden style with a mixture of colorful flowers.



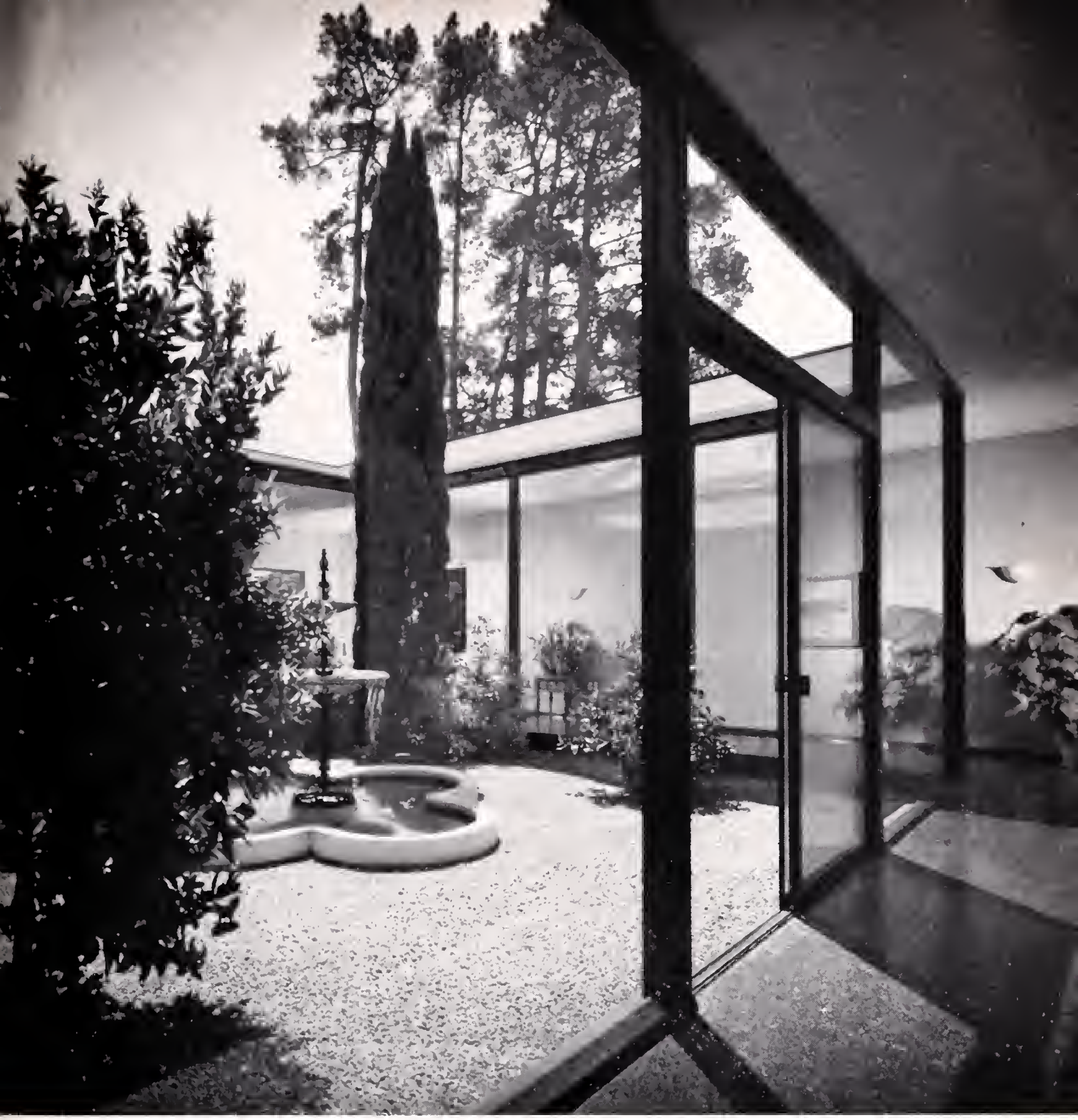
Paul E. Genereux photo

VACATION GARDEN. Flowers at the front door are appropriate to a summer residence. Tree geraniums in pots can be moved, and other seasonal plants enjoyed while they are in their prime. A few shrubs at key points hold the garden together.



Jonathan Seymour, *Landscape Architect* *Kurt Waldmann photo*

DESIGNS WITH FOLIAGE. This tropical garden has interesting leaf patterns. Irregular flat stones make a pleasant transition between terrace and pool. A similar pool could be constructed in a cold climate, but the foliage of surrounding plants would have totally different design value.



Thomas D. Church, *Landscape Architect* *Morley Baer photo*

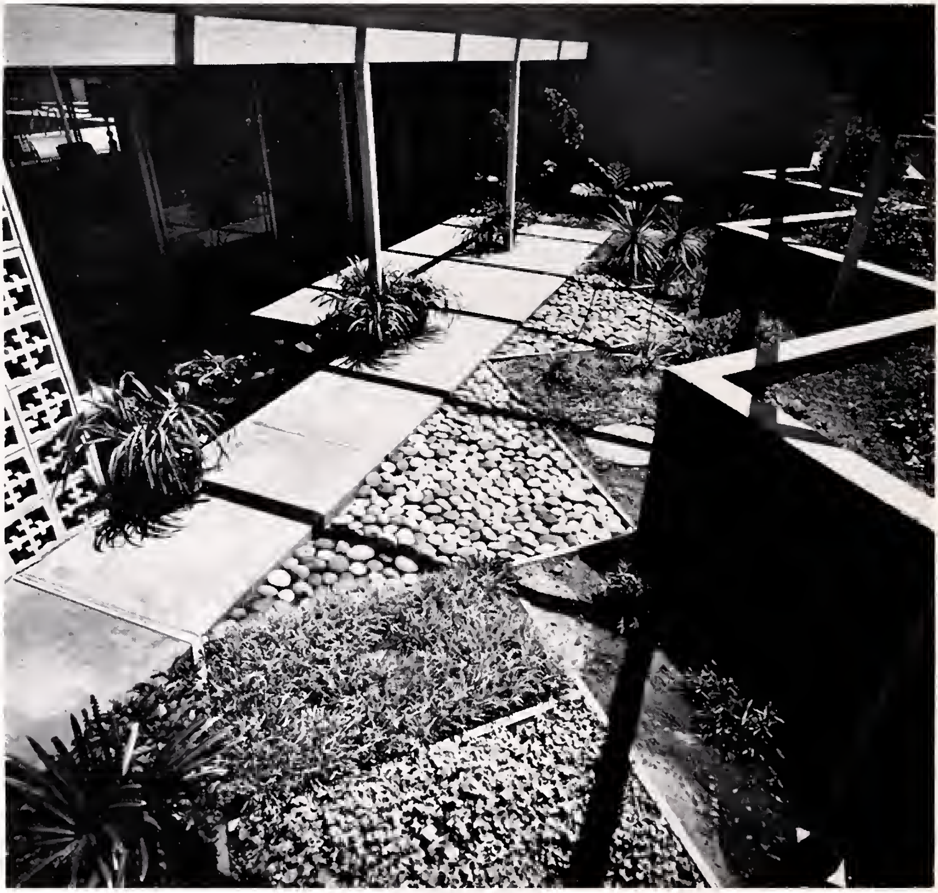
CONTRAST AND ACCENT. Curved lines of pool form a pleasant contrast to straight lines of house. The Italian cypress (*Cupressus sempervirens*) in the corner gives a needed accent in this setting of formal elegance.

> "Garden beauty is more than planting deep . . . a garden has really lasting beauty only when its basic bone structure is so fine that it makes the view from a winter window as provocative as a summer blooming."
>
> Thomas D. Church
> *House Beautiful*, January, 1948

PATTERN AND TEXTURE

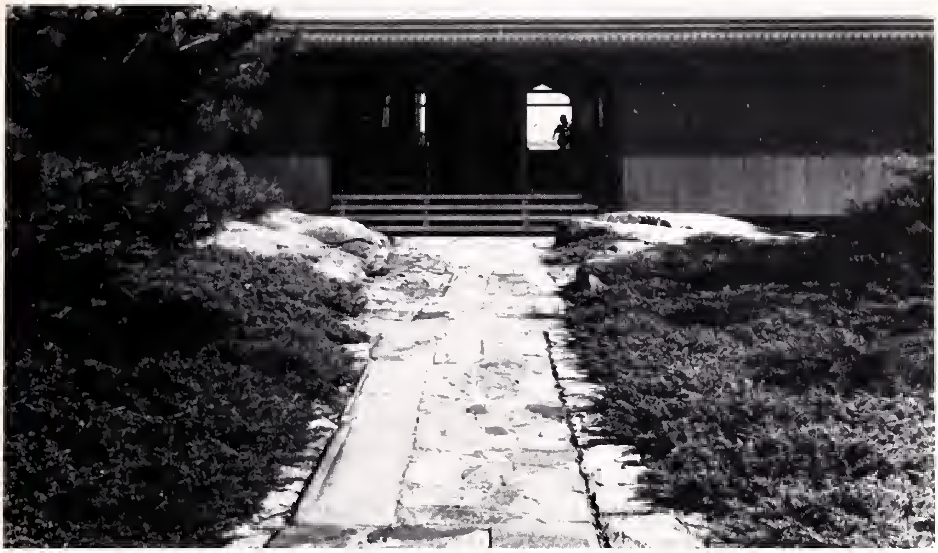
"The importance of texture in a garden increases as the pattern becomes more elusive . . . In the classic garden, the strong formal pattern needed the utmost simplicity of surface. In the modern garden, the textured surfaces themselves build up into the pattern. It is a technique particularly suited to the small garden, where the elements of design are seen at close quarters."

Sylvia Crowe: *Garden Design*
Country Life, London; Hearthside Press, New York, 1958



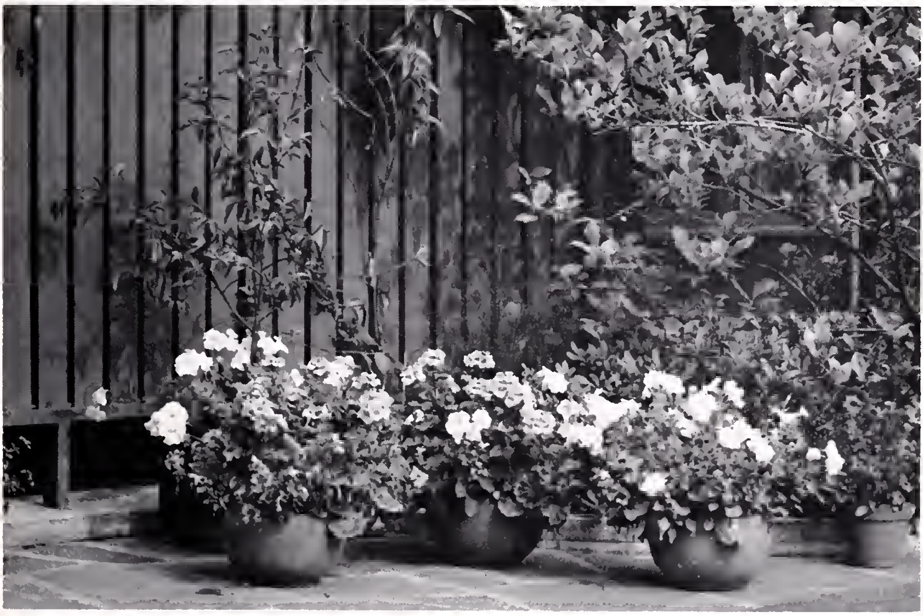
Garrett Eckbo, *Landscape Architect* *Julius Shulman photo*

INDOOR-OUTDOOR RELATIONSHIP. Proximity of garden to windows in some contemporary houses gives greater significance to garden detail. Texture and pattern of plants and garden features are observable every day, even from inside the house. Stones, ivies and ornamental grasses contrast with one another here, and each in its way helps to establish the garden pattern.



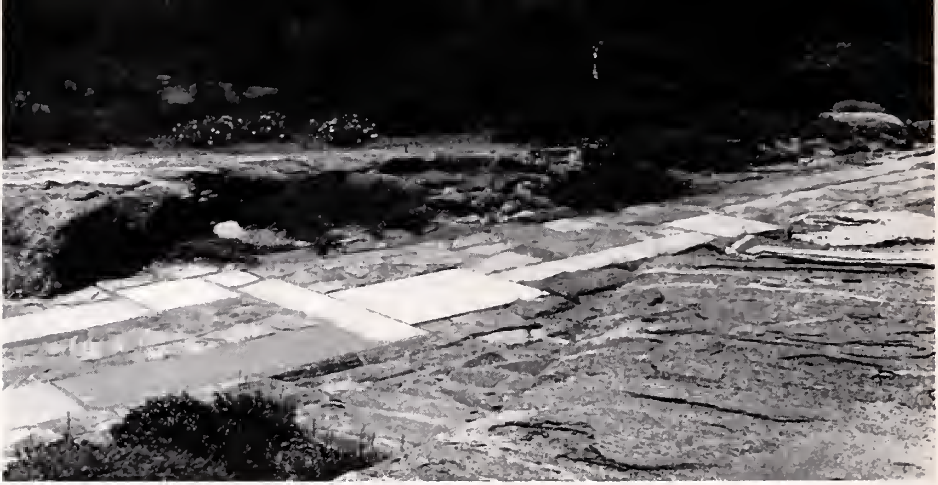
Arthur Edwin Bye, Jr., *Landscape Architect*

RELATIONSHIP OF ELEMENTS. Stone and low-spreading junipers have a natural affinity. The stone entrance walk has the right degree of roughness to provide the proper texture for this seaside home.



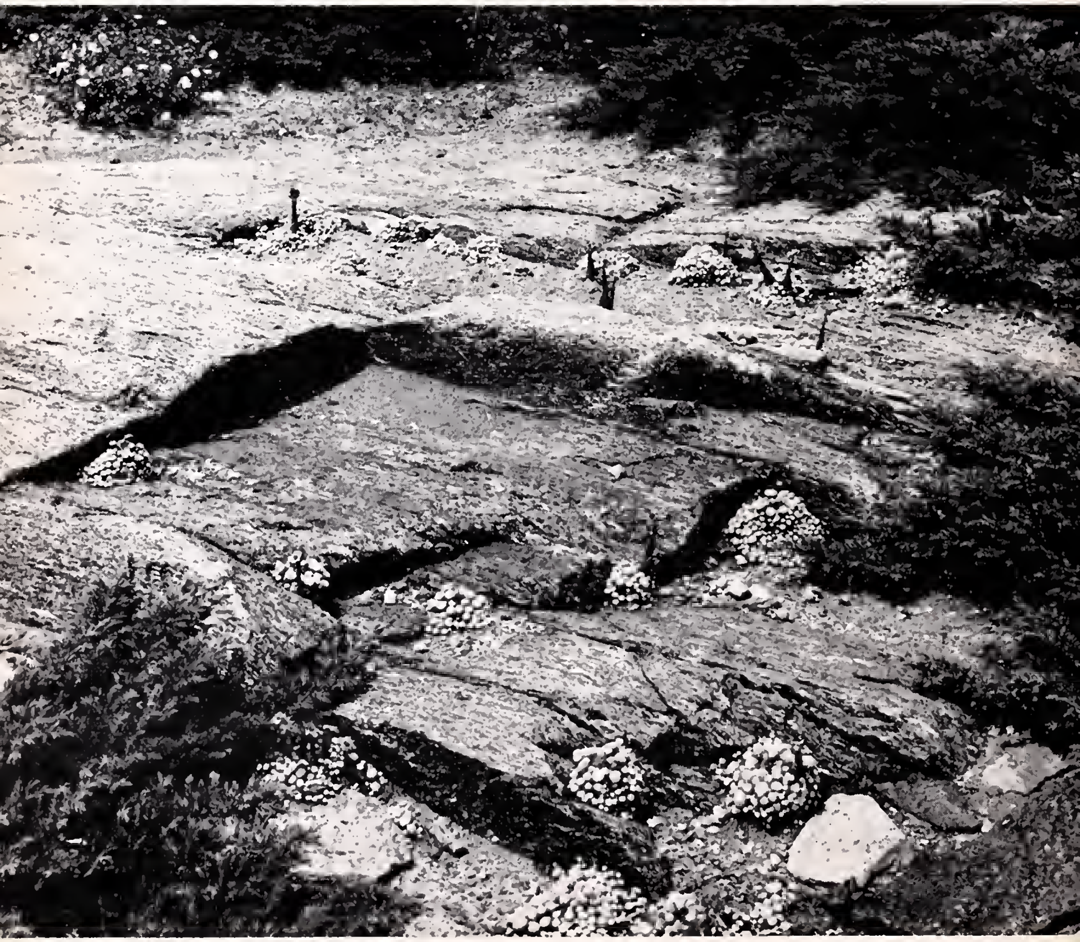
Arthur W. Erfeldt, *Landscape Architect* *Jeannette Grossman photo*

DISTINCTION WITH CERAMICS. Bowl-shaped containers have a character quite apart from the standard flower pot that is commonly used. When such special unglazed flower pots can be found, their effectiveness as planters makes the search worth while. Here each holds several pink geraniums and white petunias.



Arthur Edwin Bye, Jr., *Landscape Architect*

LINES AND TEXTURES. Straight slabs of stone are forceful in contrast to undulating lines of the native ledge. Delicate pink, green and buff colors in the rock have a lively tone. Additional texture interest is gained through the use of a few clumps of small flowering plants among the low-growing junipers.



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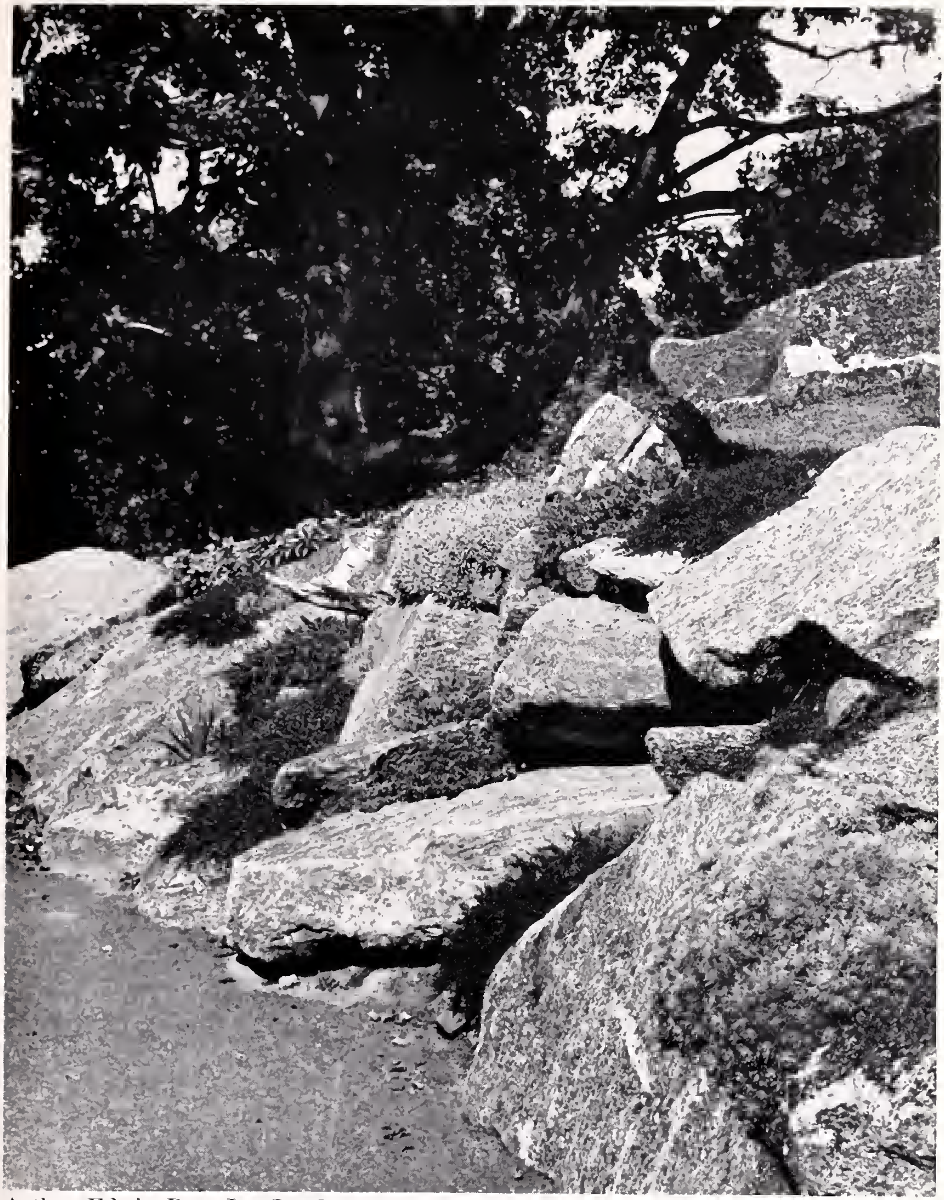
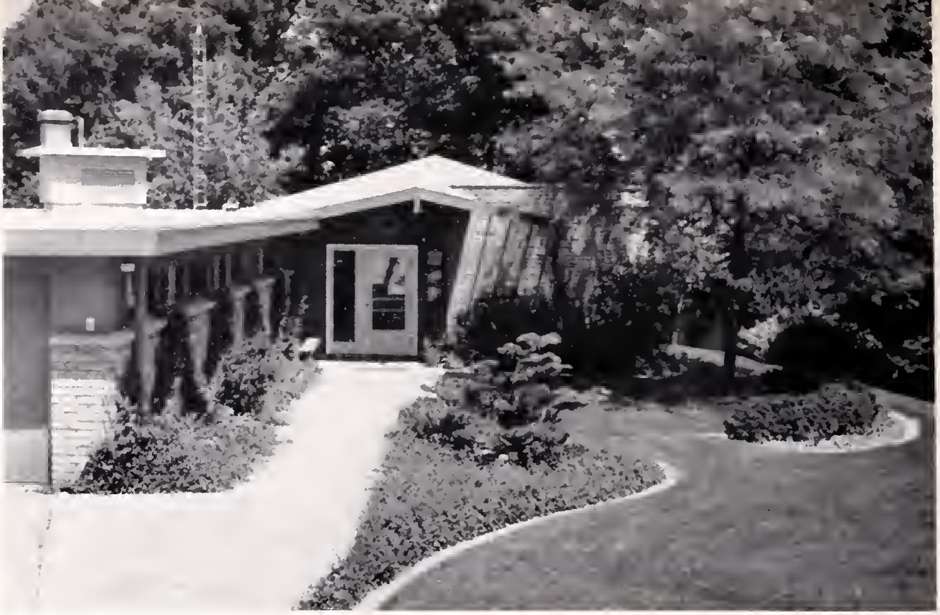


Arthur Edwin Bye, Jr., *Landscape Architect*

ROCKY BACKGROUND. Low spreading plants make an effective foil for massive sharp-angled rocks.

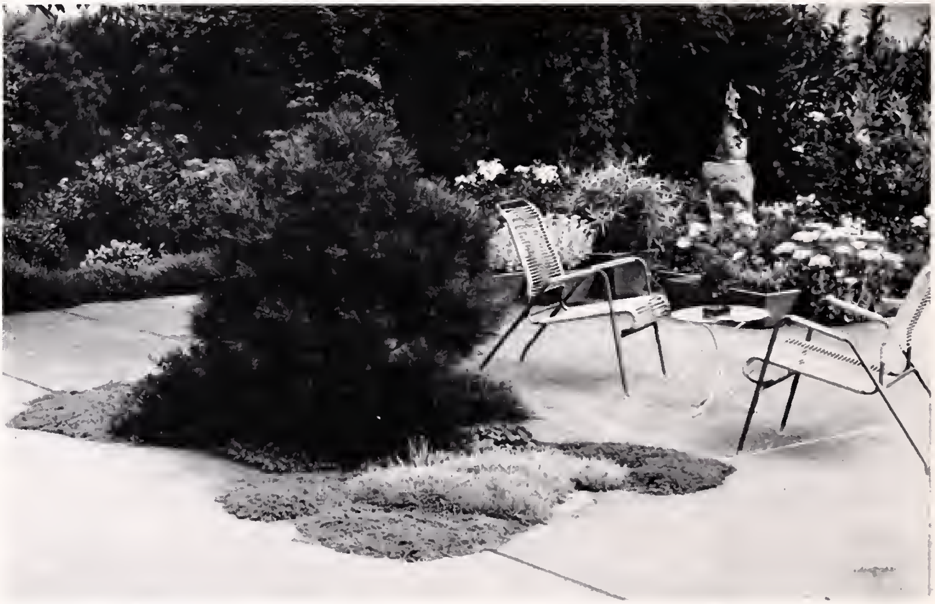
◄

NATURE AS DESIGNER. The subtle markings and colorings of a stone outcrop have a quality that man cannot duplicate. Irregular masses of dark green juniper contrast agreeably with the stone. The soft gray of cobweb sempervivum (S. *arachnoides)* takes on the appearance of living stones.



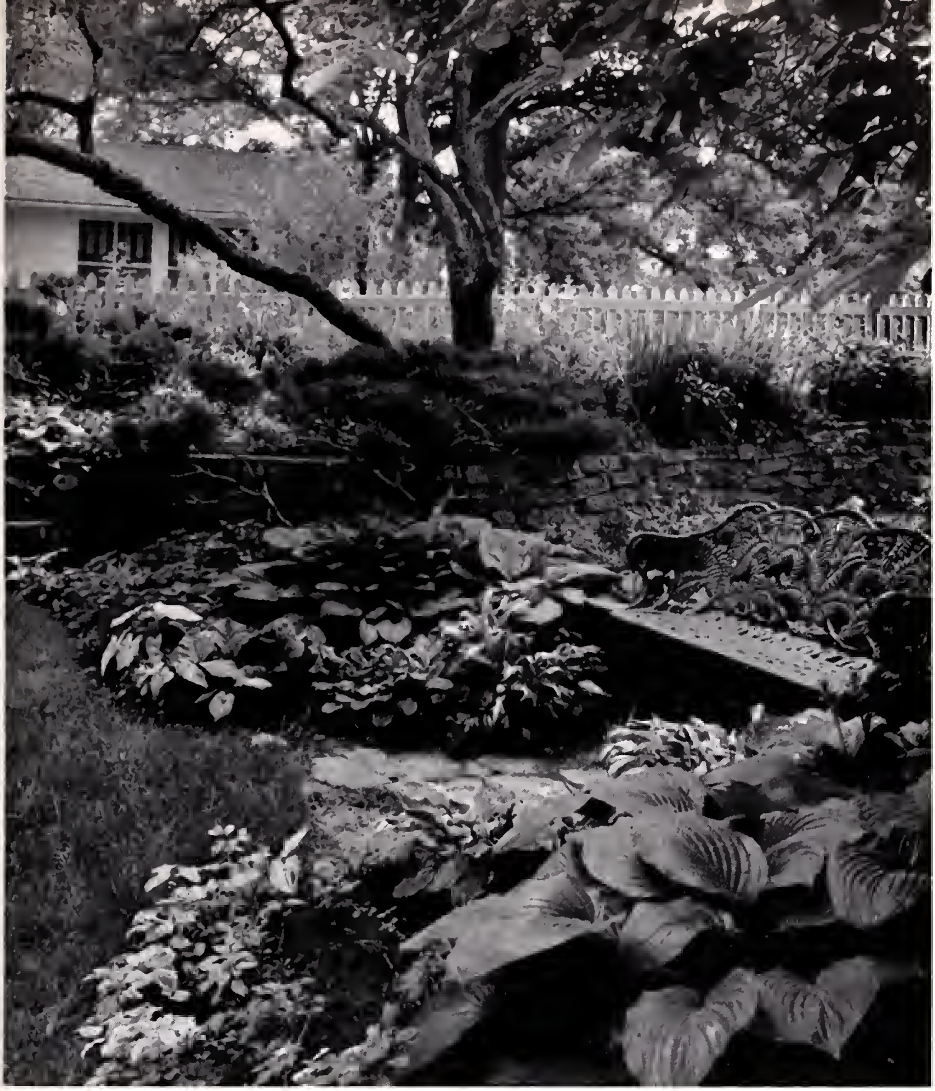
Elizabeth Howerton, *Landscape Architect* — *Gretchen Harshbarger photo*

SPIRIT OF THE ORIENT. A dwarf pine has been carefully pruned to represent a windswept tree of mountain heights. It is an Americanized version of the "cloud" pruning so carefully practiced by the Japanese. A ground cover of purple wintercreeper *(Euonymus fortunei colorata)* borders the walk.



Arthur W. Erfeldt, *Landscape Architect* — *Jeannette Grossman photo*

ACCENTUATING THE ACCENT PLANT. A dwarf white pine is set off by low light-colored masses of thyme, sedum and dianthus, whose irregular outline suggests low rolling hills in miniature. Cedar containers in background are planted with bamboo, geraniums, and showy sedum.

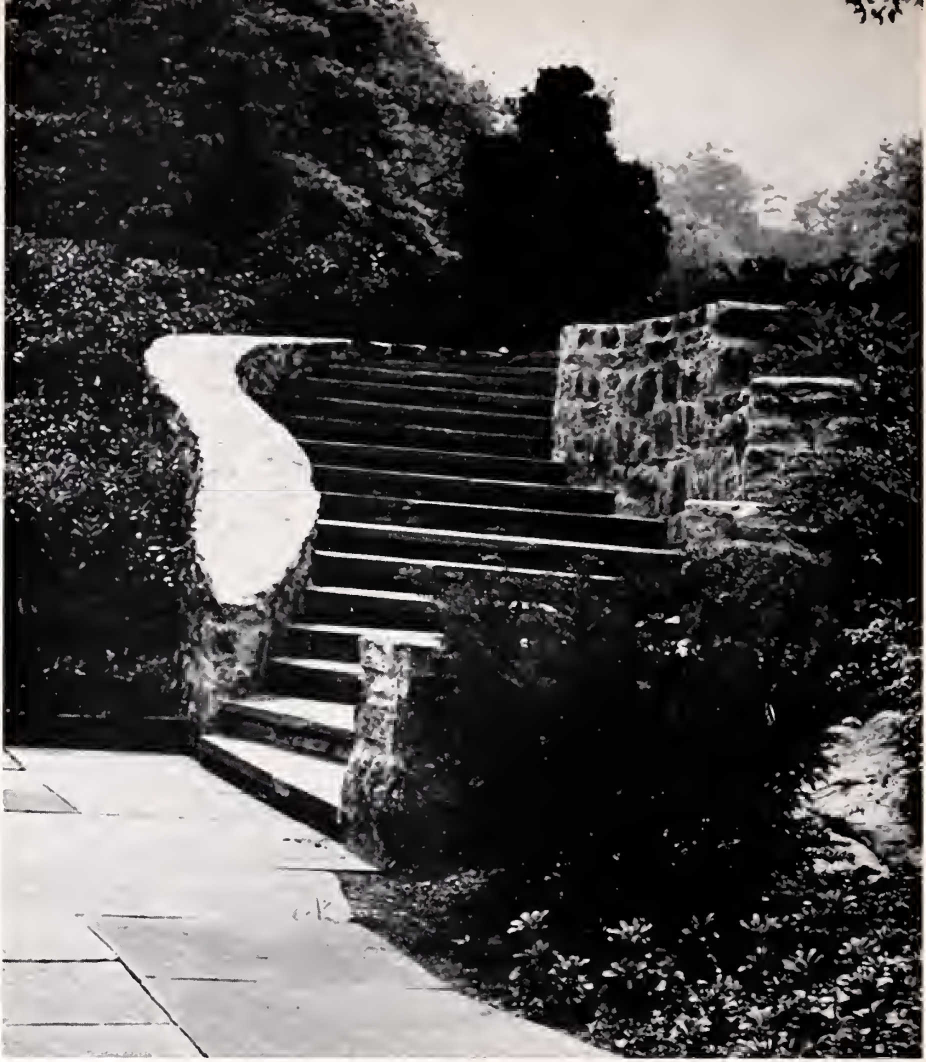


Mr. & Mrs. Cummins Rawson, *Designers* *Gretchen Harshbarger photo*

FOLIAGE PATTERN. Large leaves of hosta are in keeping with the Victorian cast-iron bench. Stone paving under and in front of the seat insures that the mower does not have to make an awkward turn to cut a small panel of lawn. The apple tree has been pruned to display the sculptural lines of trunk and branches.

"I have had great joy in forming simple compositions with this living green. A study of its song in spring, its coolness in summer, its gaiety in autumn, its joys and sighs in winter, with its ever-changing lights and shadows has given me many happy days."

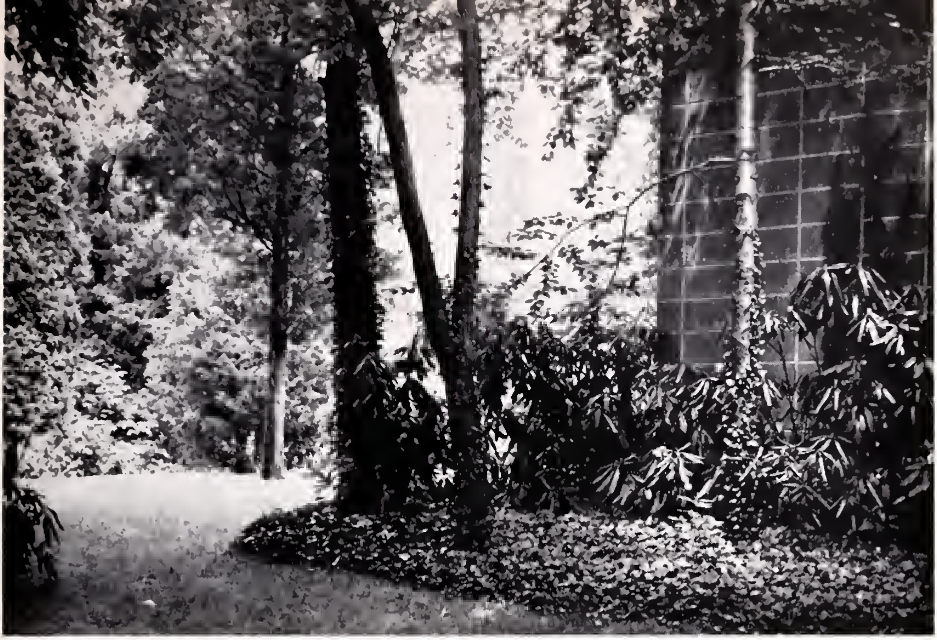
Jens Jensen: *Siftings*
Ralph Fletcher Seymour, Publisher
Chicago, 1939



Dorothy R. Morris, *Landscape Architect* *H. H. Allen Morris photo*

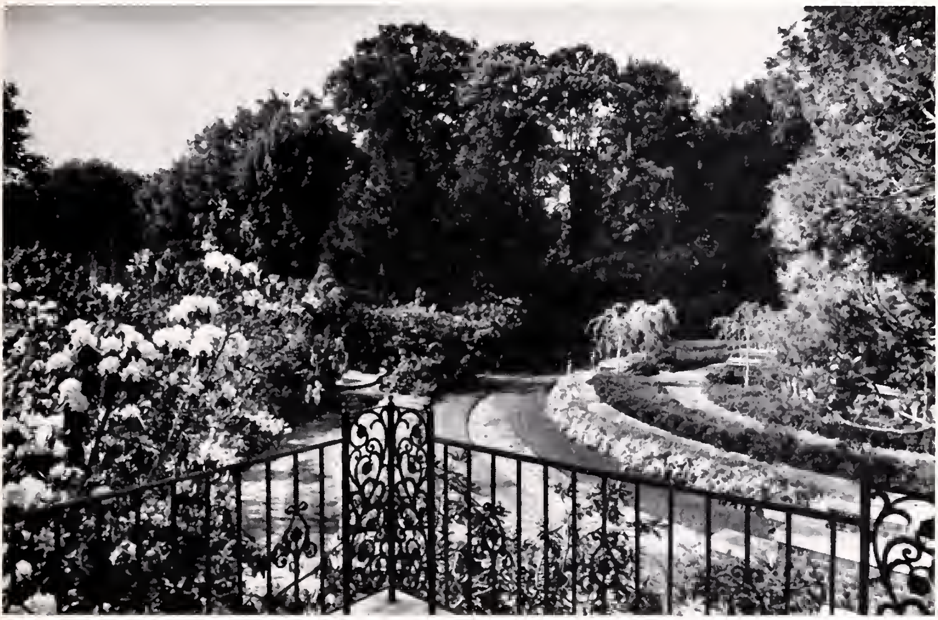
EFFECTIVE CURVES. Steps are functional in leading from one level to the next; they can also be important in pointing up the design. Here the wide side walls accentuate the curve and give a strong rhythmic line that adds distinction.

> "Light and shadow and their distribution during the entire circle of day and night are important fundamentals in the art of landscaping. Many of the fine and soft shadows in the color scheme of the Master's work are far beyond human hands to produce. But here is the real motive, the cue to the beginning."
>
> Jens Jensen: *Siftings*
> Ralph Fletcher Seymour, Publisher, Chicago, 1939
>
> (Also quoted in Leonard K. Eaton: *Landscape Artist in America—The Life and Work of Jens Jensen.* University of Chicago Press. 1964.)



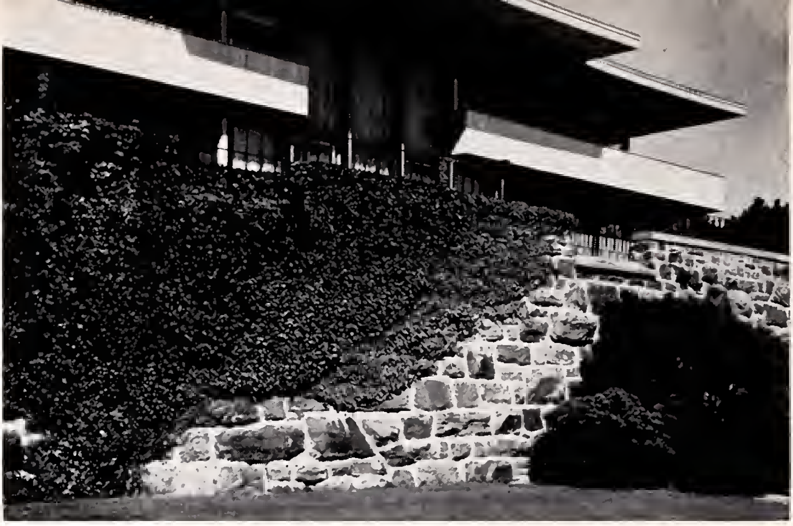
Arthur Edwin Bye, Jr., *Landscape Architect*

SIMILARITY PLUS CONTRAST. To combine well, plants should have some points in common, yet to avoid monotony they should have aspects of variance. Rhododendron and English ivy both have dark evergreen foliage and contrast in size and habit of growth. Vertical lines of the tree trunks contrast with the horizontal expanse of lawn. A stimulating quality is to be found in a garden that goes from shade to sunlit areas and back again to shade.



Goldberg & Rodler, *Landscape Designers* *Gottscho-Schleisner photo*

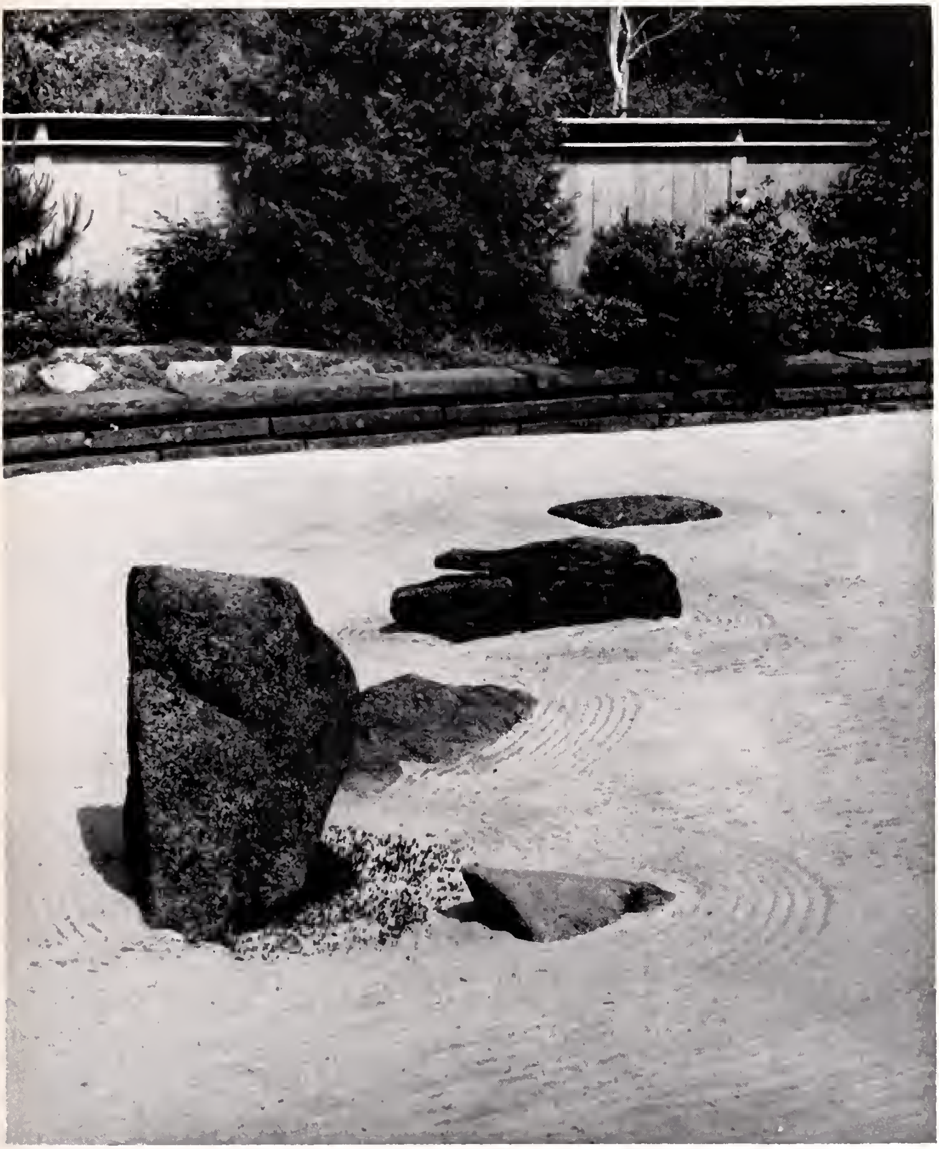
REPETITION FOR EMPHASIS. The circular shape is emphasized by repetition, but a variation in texture, color and form precludes any possible monotony.



Arthur Edwin Bye, Jr., *Landscape Architect*

COMPLEMENTARY MATERIALS. The ruggedness of the mugho pine *(Pinus mugo)* at right and the massiveness of the stone wall go well together. The Boston ivy *(Parthenocissus tricuspidata)* relieves the over-great expanse of wall. Pruning is important to maintain a certain balance between vine and wall.

Arthur Edwin Bye, Jr., *Landscape Architect*



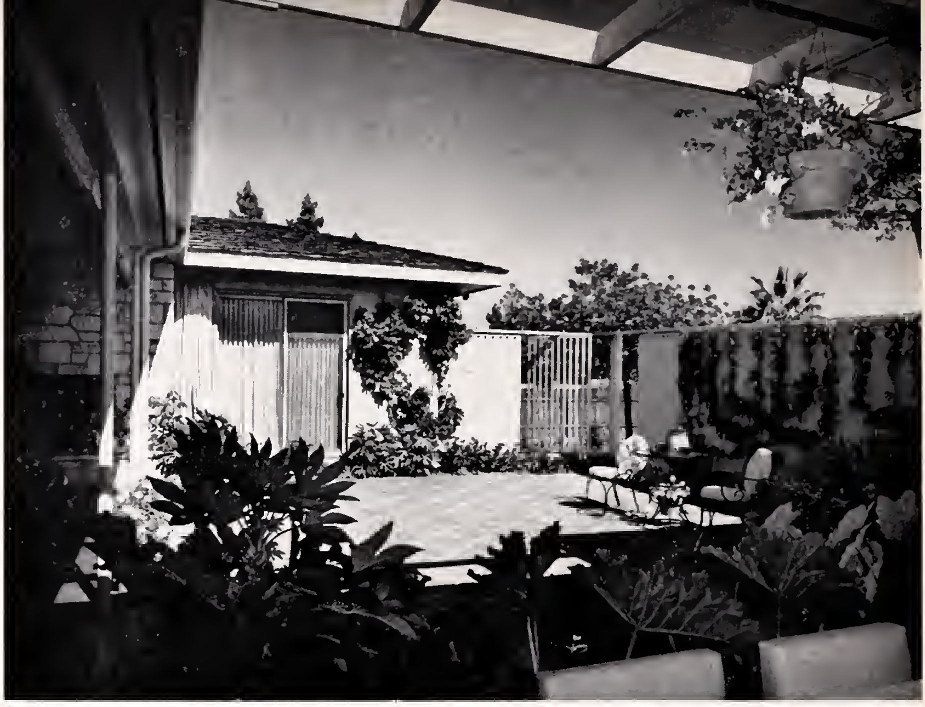
J. P. Roche photo

Charles Savage, *Designer*

ADAPTATION FROM THE JAPANESE. A contemporary version of a stone and sand garden such as the Japanese have been making for many centuries. Sand is raked to give the ripple effect of flowing water.

◄

STUDY IN TEXTURES. Low spreading junipers selected for variation in color and foliage density offer a pattern that simulates a wavy sea. The small clump of blue festuca *(Festuca glauca)* with its light and spiky foliage introduces an unusual note.

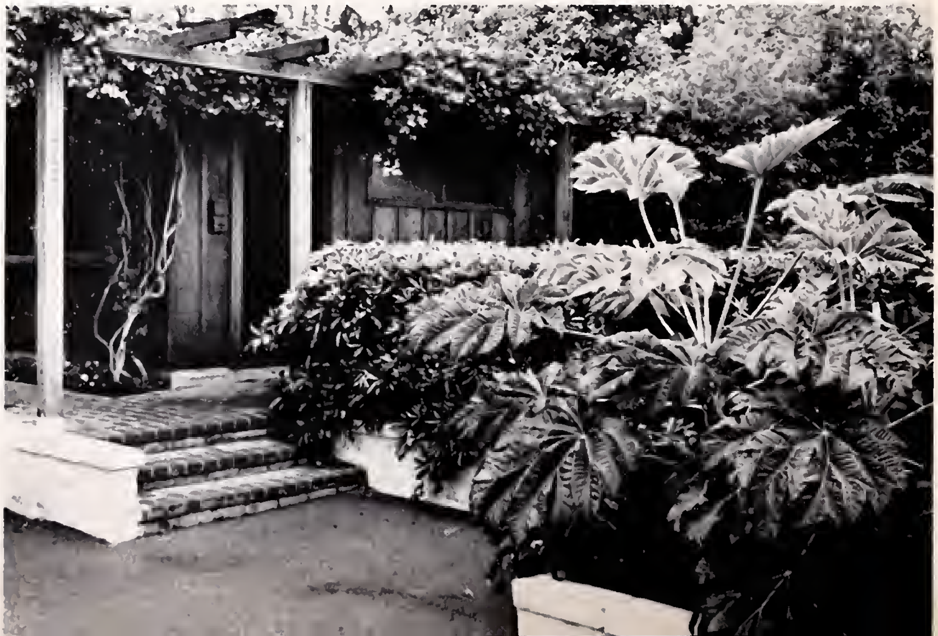


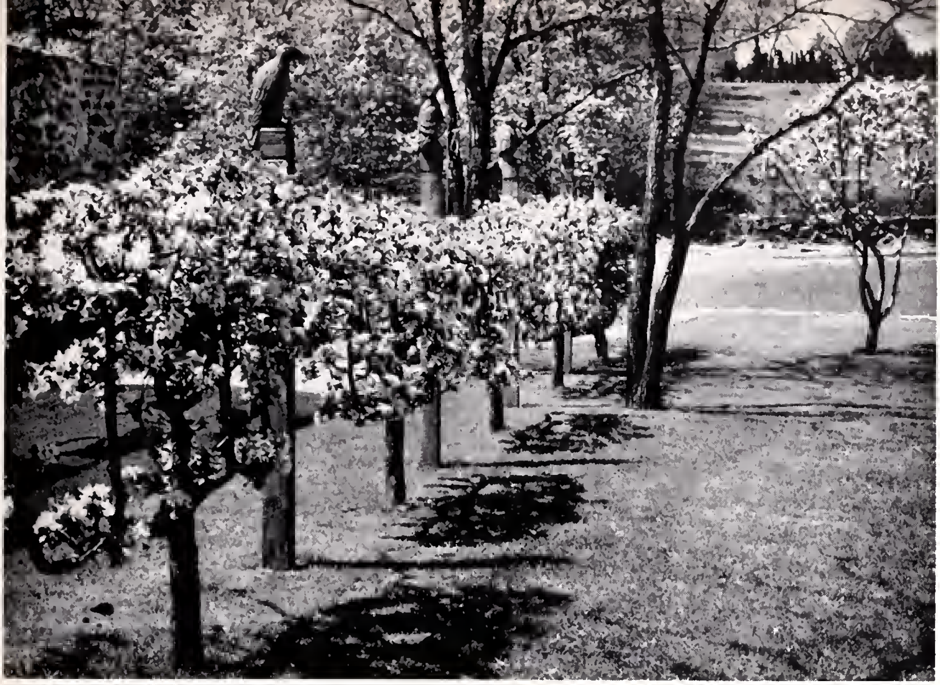
Peggy Sullivan, *Landscape Architect* *Julius Shulman photo*

BOLD FOLIAGE. Large leaves offer arresting patterns. Espaliers add a finishing touch but take little ground space. Open vertical slats have been spaced to provide a view of garden beyond, yet form a boundary for the patio.

LEAF AND STEM PATTERNS. Plants with extra large leaves may be effectively placed adjacent to a dark glossy green hedge. Stem of vine makes an interesting pattern against wall of house.

James Roth, *Designer* *Gretchen Harshbarger photo*



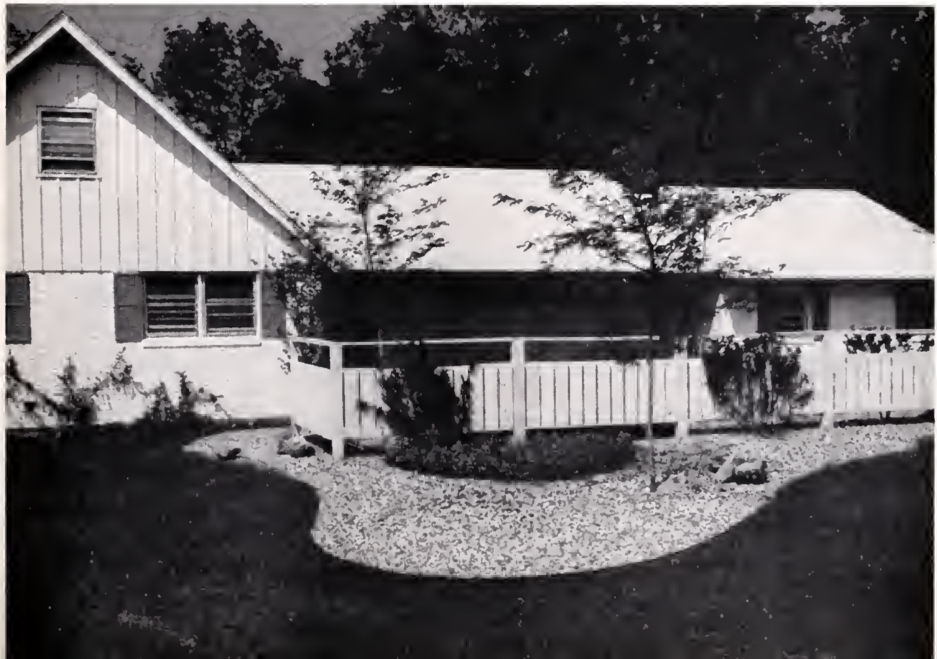


Mary Deputy Cattell, *Landscape Architect* *Gottscho-Schleisner photo*

DIVIDING LINE. Instead of a wide solid hedge a slender row of free-standing espaliered fruit trees provides a divider between lawn and garden area. Carved finials of fantasy birds add a humorous note.

CURVES AS GUIDE-LINES. Free-flowing curved line directs the eye from one plant mass to the next. Espaliered yews, firethorn *(Pyracantha coccinea lalandi)* and thornless honeylocust *(Gleditsia triacanthos inermis)* are the chief plant materials used here. A few large stones give variation to the pebble area.

Goldberg & Rodler, *Landscape Designers* *Mal Gurian photo*



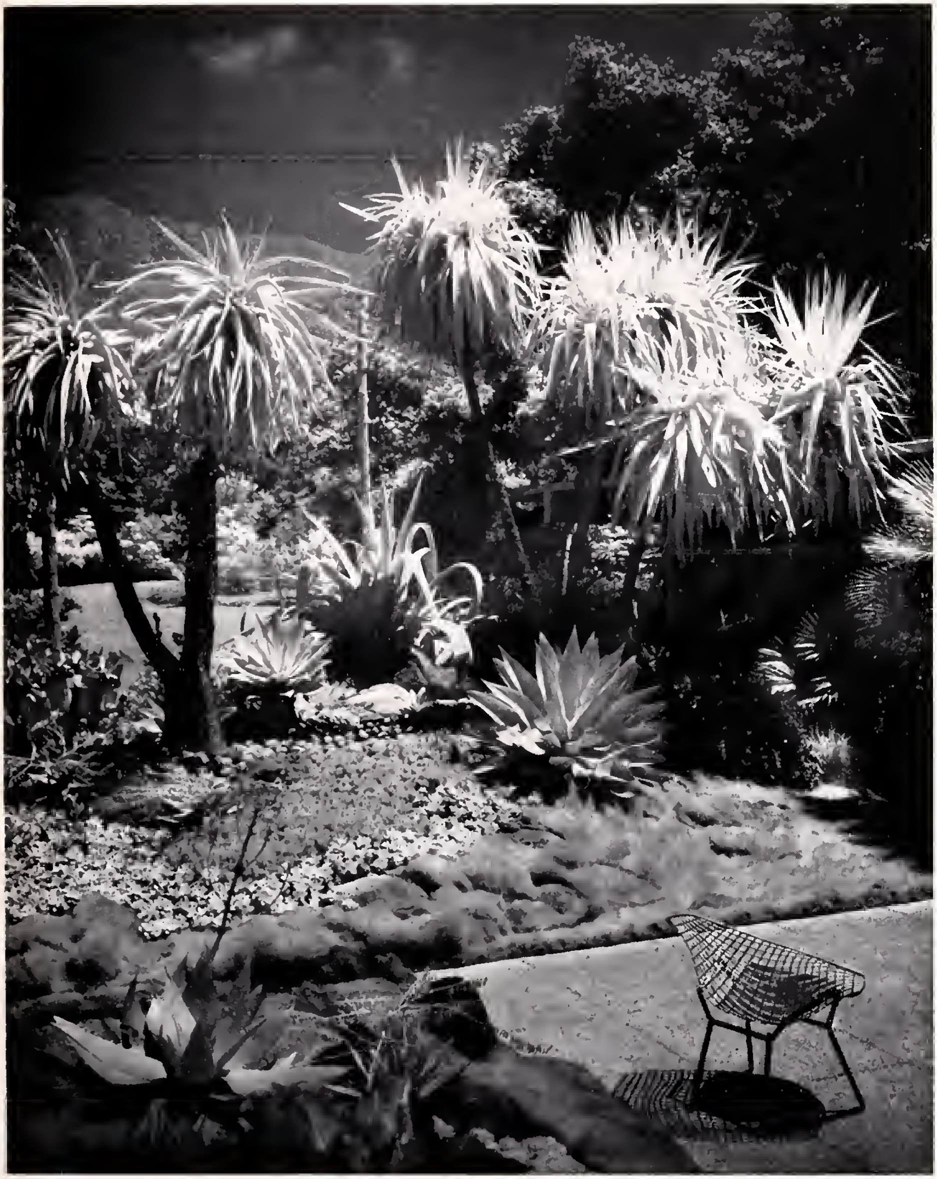
Thomas D. Church, *Landscape Architect*

Karl H. Riek photo

LIGHT AND SHADE EFFECTS. Bright flowers in the sunshine and light-colored sculpture in the deep shade of the pines bring vitality to this garden

PARALLEL LINES. A wide, flat overhang provides shade for camellias during the hottest part of the day. Horizontal slats of adjacent fence conform to pattern and are in accord with straight line of tall hedge.

Maynard L. Parker photo



Courtesy House & Garden
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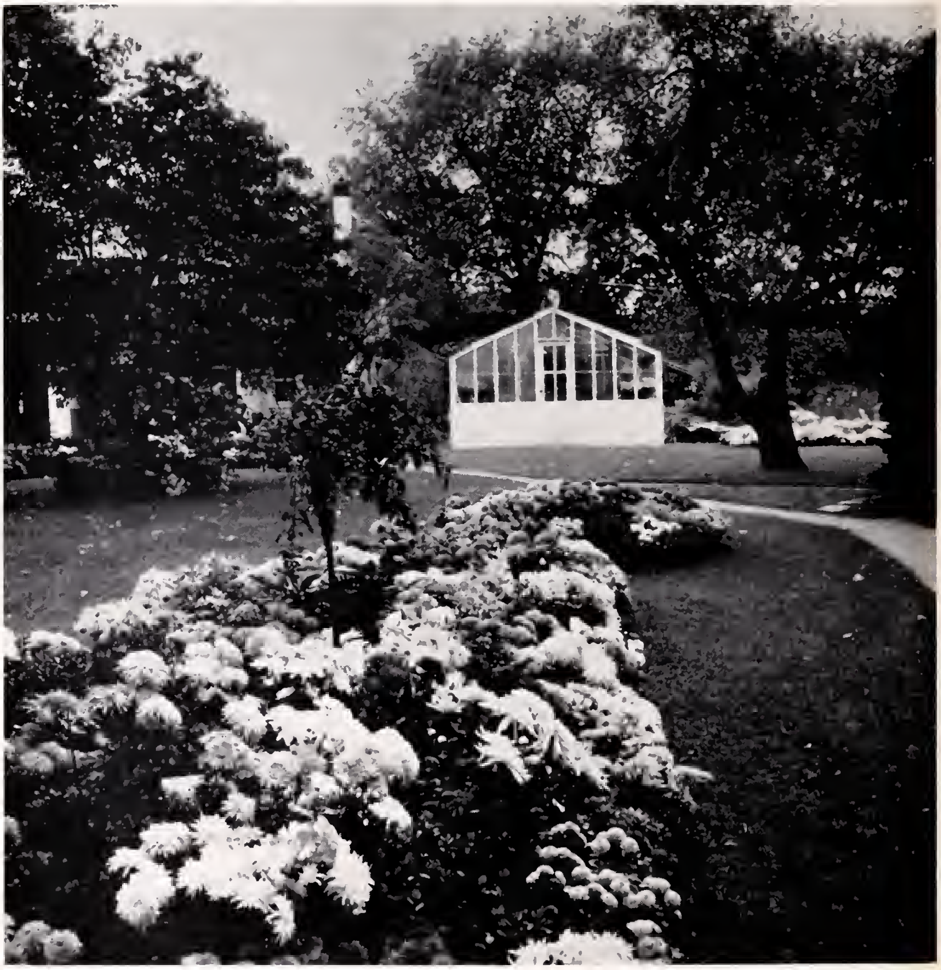
DRAMATIC DUPLICATION. In this California garden, repetition of form makes for an exotic-appearing scene. One specimen of dracaena with its stems silhouetted against an open area balances a larger mass where the trunks fade into the background. The large rosettes of leaves at ground level that reconcile the tall plants with the low-growing masses of small succulents are agaves. The fine-leaved grass in the foreground is Japanese zoysia.

◀Thomas D. Church, *Landscape Architect*

GARDENS FOR COLLECTORS

"Art must be a guide, a leader, in the evolution of mankind toward a higher spiritual goal. None of the arts is more able to do this than that of the garden. It is a living expression of peace and happiness, and therefore a great influence in the forming of a people."

Jens Jensen: *Siftings*
Ralph Fletcher Seymour, Publisher, Chicago, 1939



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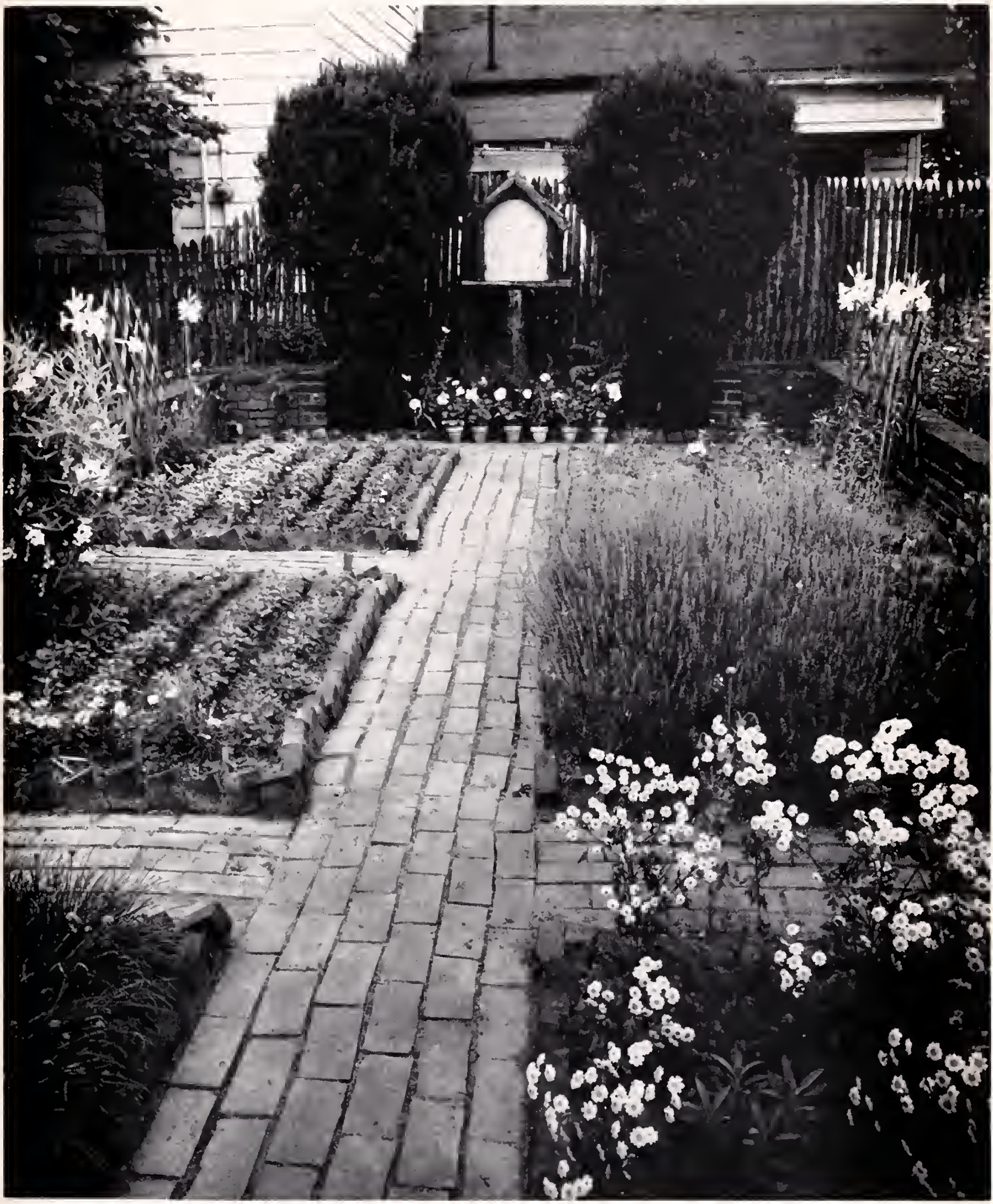
CHRYSANTHEMUMS. Many types and colors of chrysanthemum are in this autumn display. Such plants can be moved to the show garden from the growing area when they are ready to bloom. The greenhouse can be used for late-flowering varieties.



Mrs. W. Everett Rowley, *Designer* *J. P. Roche photo*

HERBS. Grown for their aromatic properties as well as culinary uses, herbs are valued also for their individual character and cherished for the many legends associated with them. Beds and rows in a garden such as this are equally suited to flowers for cutting or to low-growing vegetables.

J. P. Roche photo

Zenon Schreiber, *Landscape Designer*

ROCK GARDEN. Low-spreading alpine plants have a natural affinity for rocks. Dwarf evergreens make a suitable background planting. Flowering kinds have been selected here to provide color over a four-month summer growing season.

Rosalie Doolittle, *Designer* *Gretchen Harshbarger photo*

ROSES. A collectors' rose garden, edged with lavender-cotton (*Santolina chamaecyparissus*) to bring unity to garden and dwelling.

Mr. & Mrs. Kenneth D. Smith, *Designers* *J. P. Roche photo*

IRIS. The long sweeping line of the flower beds in this garden fits the rolling terrain and the naturalistic setting. To extend the limited season of iris, "rebloomers" may be used; given extra summer fertilizing and watering, they flower in autumn as well as spring. Examples are 'Ruby Glow', red; 'Cosette', white; and 'Black Ebony', dark purple.

> "A garden is an adjustment of land to human appetite. The garden is a token—a symbol—of what its maker cares about."
>
> Fletcher Steele: *Gardens and People*
> Houghton-Mifflin Company, Boston, 1964

Courtesy House & Garden
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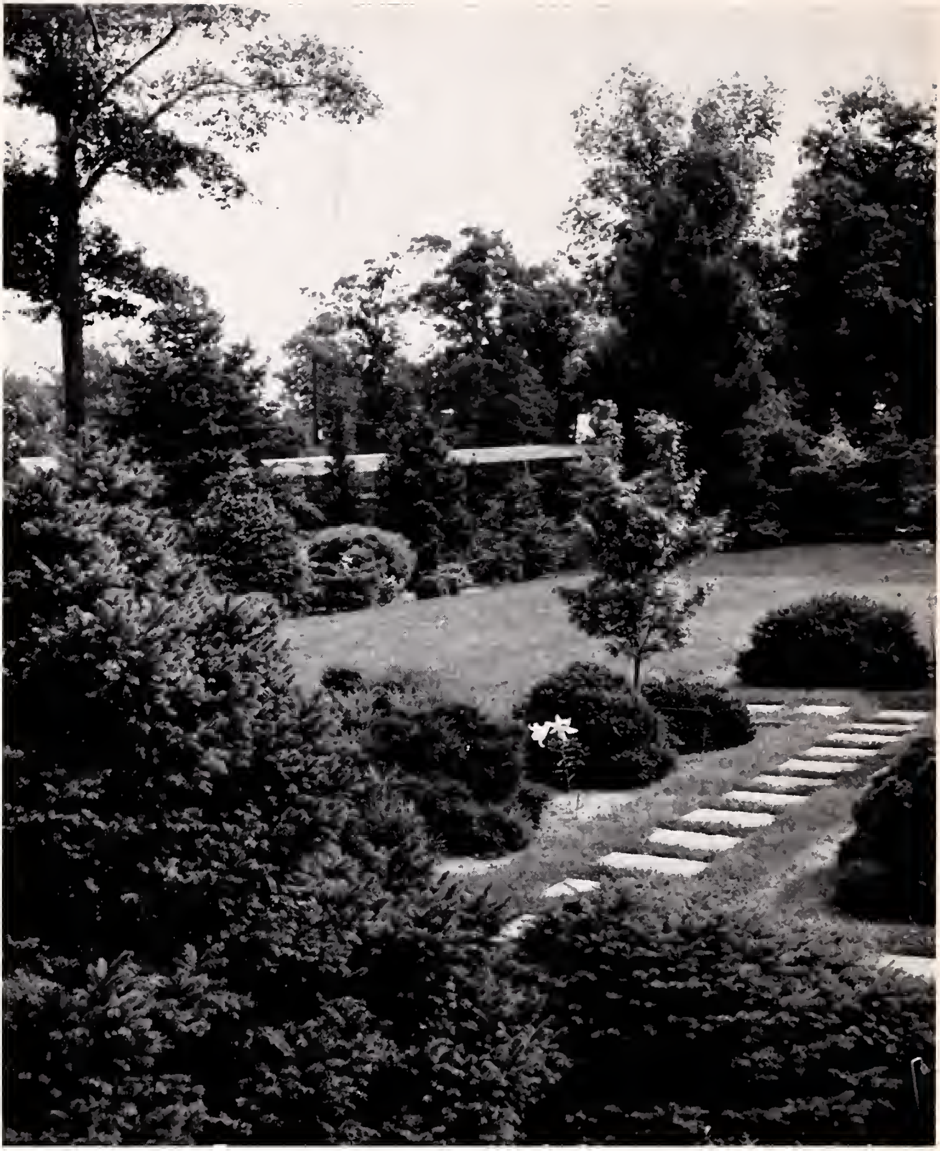
DAYLILIES (HEMEROCALLIS). Partial shade or full sun are equally suitable for daylilies, which are carefree plants. Their foliage lasts until late in the season. Some varieties bloom in spring, others during summer and early fall. Pale yellow, lemon yellow and orange are the dominant colors, with clear tones of red introduced in recent years.



J. P. Roche photo

DWARF EVERGREENS. A garden of dwarf evergreens is something to excite the avid collector. He may travel far in search of these slow-growing gems, plants that take so long to mature that relatively few nurserymen can devote the time to having even a few among their stock. To have the pleasure of watching these miniatures develop into specimens large enough to plant in a display garden, small grafted plants can be obtained from specialty nurseries.

[For a list of nurseries which supply them, send a stamped self-addressed envelope to Brooklyn Botanic Garden, 1000 Washington Avenue, Brooklyn, New York 11225].

POINTS TO KEEP IN MIND IN HOME LANDSCAPING

BACKGROUND. Tall plants, fence, or wall at rear of garden should be of neutral design to complement the principal feature without diverting attention from it.

BALANCE. Equilibrium of elements (masses, colors, forms, etc.) imparts serenity to a design. Formal balance may be achieved by balance of weight, as by like objects; informal balance by balance of equal interest; thus a small mass of color can balance a large neutral mass.

CONTRAST. When variation in form, color or texture is employed, monotony is avoided and emphasis gained.

OPEN CENTER. Use of a grass panel is one way to keep a central area free of items of major interest. High-branched trees may be placed there but not specimen shrubs. An open center helps to bring about simplicity of design; makes a property appear larger.

REPETITION. Duplication of certain elements is an aid to gaining UNITY, BALANCE, and RHYTHM. In a formal treatment the same element is commonly repeated. For informal design the repetition is not so absolute; for example, the color tone may be repeated but the form, texture, or quantity would not necessarily be the same.

RHYTHM. Harmonious lines, frequently curved ones, give a composition rhythm by carrying the eye easily from one part to another. REPETITION augments the effect.

VARIETY. As provided by contrast of form, color, and texture, variety in a garden gives vitality and prevents monotony. It should not be overdone, for excess of variety is more tiring than excess of unity.

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BROOKLYN BOTANIC GARDEN RECORD

PLANTS & GARDENS

WINTER
1965-66

The
Year's Highlights
in
Gardening
and
Horticulture

Guide to
Recent
Nontechnical
Books and Articles
for Gardeners

NEW SERIES
VOL. 21 NO. 4

APR 19 1966

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(Concluded on page 65—inside back cover)

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*Member of the Brooklyn Botanic Garden.

PLANTS & GARDENS

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WHAT IS A GARDEN?

Carlton B. Lees

Reprinted from *Horticulture*, March 1965

For a year, now, we have been asking the question, "What is a garden?" We've found many answers which, to us, seem appropriate, but none are complete. Why? Because the garden concept bridges art and science.

If we are to consider the shortcomings, I think the basic weakness is in lack of understanding of the garden as an art form. We tend to reduce it to the hobby level when we also should be aware that gardening is concerned with the creation and conservation of human environment. The garden, then, does not end with the petunia bed, the perennial border or even foundation planting. It includes the whole of your property which, in turn, influences your neighborhood, your ctiy, your country.

Gardening is a part of community development, of city planning, urban renewal and of conservation. Today, we are more concerned about green spaces, watersheds, wildlife sanctuaries, parks and recreational areas than ever before. Indeed, we have come to realize that even our seaside marshlands contribute to our well-being. What was considered worthless land (except for producing salt-marsh hay, perhaps) is found to be essential.

And so it is with all outdoor space. Your "backyard," however large or small it may be, contributes to the total environment of man. Recall how many pleasures you behold as you move about, everywhere—a marvelous elm, a pink bouquet of a crab apple in full bloom, the richness of a mass of fine rhododendrons, a front door draped with welcoming clematis or roses—these may not "belong" to you in the sense of ownership, but they contribute to your pleasure and are a part of your environment. And this is what gardening really is—*the organization of outdoor space for man's use, comfort and pleasure*. It depends upon the contribution of each of us gardeners.

Mr. Bruce Gullion of the Massachusetts Department of Natural Resources has said, "Many children today do not know where even a carrot comes from, and through not knowing may grow up to destroy the very environment which sustains them." It is unfortunate that many Americans, young and old, are unaware of Mr. Gullion's symbolic carrot. For us this offers an opportunity and a challenge.

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The Year-end 1965-66

As most readers will recall, each of our year-end issues is largely a presentation of outstanding articles that appeared in other journals during the past year. Our original search of the gardening, horticultural and conservation literature for 1965 brought in nearly 100 articles of unusual interest and/or significance as candidates for this 1965-66 year-end issue of **PLANTS & GARDENS**. Not all could be included here, so then came the difficult task of stricter selection, in order to present ideas and information that would be useful or challenging to our readers.

When the Editorial Committee's final choices had been made, we were surprised and pleased to discover that one-fourth of the authors of the works selected are or have been members of our Botanic Garden Society. We are proud to honor them and their fellow writers for outstanding contributions to the written word for 1965. Publishers as well as authors have given special permission for the reprinting of articles, mostly in condensed form, in this issue. We acknowledge their warm cooperation with grateful appreciation.

How important it is for us to be interested in things that concern our neighbors and society generally, more than only ourselves! "Planning the Environment" (p. 4), is important reading for every thoughtful American, as are the several articles on saving the natural environment (pp. 18, 36, 37).

On the gardening front, there are two articles on Flower Shows (in London and New York) (pp. 28-29) that offer both humor and constructive criticism. Then, for the best technique of conserving precious soil moisture, be sure to turn to pages 10 and 11. There are many other gems, none of which should be missed.

Did you know that bees can make and use honey that is poisonous to human beings? A dramatic account of this starts on page 48.

Best wishes for a successful year with your gardens and plant collections.

George S. Avery, Jr.

Director

PRUNING PRACTICES AT THE BROOKLYN BOTANIC GARDEN

It is a pleasure to announce the availability of this new 22-minute sound motion picture, in full color. It was filmed in the Garden by Stuart Chasmar, based on script prepared by the Garden Staff. It portrays much of the beauty of the Botanic Garden at the same time that it teaches pruning principles and practices. It is a refreshing and exciting presentation.

Inquiries about rental or purchase should be addressed to Brooklyn Garden, Brooklyn, New York 11225.

Morley Baer

Broad parklike area bordered by pines is shared by all twelve property-owners of Greenwood Common, Berkeley, California. San Francisco Bay lies in the distance.

The new emphasis:

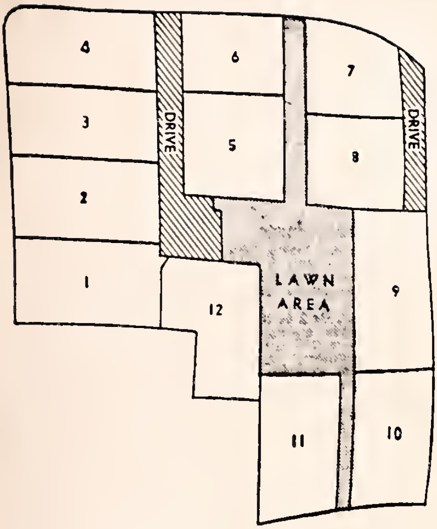
PLANNING THE ENVIRONMENT

Joan Lee Faust

©1965 by The New York Times Co.; condensed from *The New York Times*, Aug. 8, 1965

THE preservation of open spaces is as much a part of the landscape architect's creed as it is of the conservationist's. When architects and landscape architects get together to plan a community, the results are usually extraordinarily successful. Pictured here is Greenwood Common in Berkeley, Calif. Though modest in size, it is a gem of an example of environmental planning. The site covers two-and-one-half acres on a high bluff facing westward toward San Francisco Bay. Eight families reside here. Each home has its own private garden, but beyond the seclusion fencing is a broad parklike common that is shared by all. It provides a place where the children can play off the streets and where neighbors can sit and chat. The common is fed by one main road so the houses have driveway access to the carports.

This environmental planning is the joint effort of William Wilson Wurster, former Dean of the College of Environmental Design at the University of California (Berkeley), and landscape architect Lawrence Halprin. Mr. Wurster's



Layout of lots and community park in the "planned environment" of Greenwood Common

home overlooks the bluff that now is the common. Encroaching real estate development threatened the open view from his home. When the two-and-one-half-acre site became available, Mr. Wurster purchased it. Together he and Mr. Halprin worked out a scheme to make an ideal living community on a relatively small site. Mr. Halprin divided the area into 12 parcels (eight houses now are constructed) with an open space or common. A few existing pines were the nucleus for the development of the landscape design.

When lots were sold, each property owner hired his own architect and landscape architect to design the house and grounds. Though each house has individuality, the abiding impression is one of harmony and blend rather than harshly contrasting styles.

Trees, flowering shrubs and vines partially shade the brick-paved patio on lot 12 at Greenwood Common. Just beyond is a raised play area.

Morley Baer

SELECTING THE RIGHT TREE FOR EVERY LANDSCAPE NEED

TREES are an integral part of outdoor space, their roots, trunks and branches forming the framework of the landscape. Because each kind has a distinctive habit of growth, its selection as well as its placement involves a responsibility that should not be lightly assumed.

When trees are scattered indiscriminately throughout an area, a restless, disconnected composition results. Each new specimen, wherever it is placed, should fulfill a landscape need. Every tree considered should first be studied from several points of view—among them its eventual size, its form, its environmental requirements and location.

A. F. DeWerth

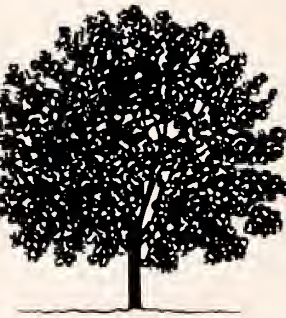
CERTAIN characteristics of trees are of particular importance when selections are being made for landscaping. While a preliminary choice may be made on the basis of whether a tree is deciduous or evergreen, fast-growing or slow-growing, flowering or non-flowering, or with or without showy fruit, other less noticeable factors deserve attention.

Size

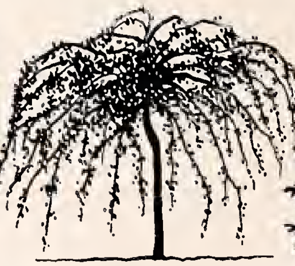
Trees should be classified for size only in broad terms—such as small, medium, large—since their development may vary widely depending on climatic extremes, exposure, soil conditions, availability of water, and the care they receive after planting.

Condensed from the *Garden Journal* of The New York Botanical Garden, May-June 1965

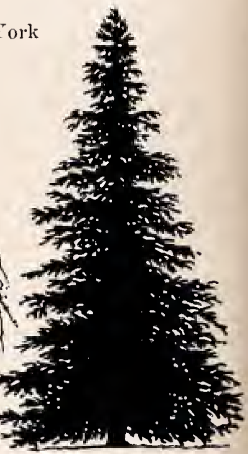
Lombardy poplar
(*Populus nigra italica*)
ERECT
Other examples:
Holly (*Ilex opaca*)
Flowering cherry (*Prunus serrulata* 'Amanogawa')
Also columnar and fastigiate varieties of other trees



Rose-flowered crab
(*Malus sargenti rosea*)
ROUND-HEADED
Other examples:
Jap. maple (*Acer palmatum*)
Hawthorn (*Crataegus oxyacantha*)
Saucer magnolia (*M. soulangeana*)



Weeping Jap. cherry
(*Prunus subhirtella pendula*)
WEEPING
Other examples:
Flowering crab ('Red Jade')
Weeping willow (*Salix babylonica*)
Also weeping ash, beech, hornbeam, pagoda-tree



Colorado blue spruce
(*Picea pungens* variety)
PYRAMIDAL
Other examples:
Douglas-fir (*Pseudotsuga menziesi*)
Cryptomeria (*C. japonica*)
Nordmann's fir (*Abies nordmanniana*)

Small trees are those which rarely, if ever, attain an ultimate height of over 25 feet.

Medium trees reach an ultimate height of from 25 to 35 feet.

Large trees will reach a height of 40 or more feet at maturity.

Form

Form is perhaps the most exacting requirement for the proper use of trees.

Erect trees are upright and narrow with a slender, towering effect. The more extremely erect, that are tapered to a point, are said to be fastigiate. They are useful for accents in massed plantings or to accentuate the vertical in architectural detail. The columnar types have the same growth characteristics but lack the acute tip.

Spreading trees are of free natural growth and require considerable space to develop fully. The limbs extend in a lateral direction and the tops are often flat. When this growth is extreme, these types are sometimes injured in heavy storms; therefore they should not be planted where exposure to high wind is anticipated. Such trees tend to become picturesque in old age.

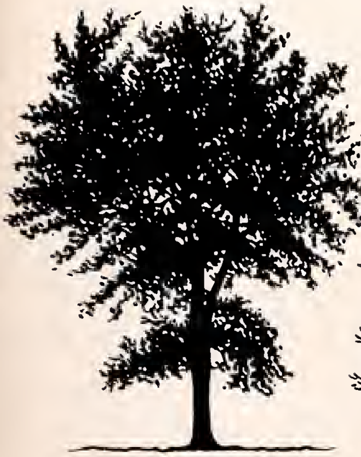
Open-headed trees are typically indistinct in outline as well as loose and open in structure. Since they create little impression in form or mass, their main value in landscape design is their tracery against the sky, or the light shadows they cast upon the ground. They are better planted in groups or backgrounds rather than as individual specimens.

Round-headed trees have crowns which form an arc in outline and are curving in configuration. They may have a compact, dense head or an open-airy arrangement of foliage.

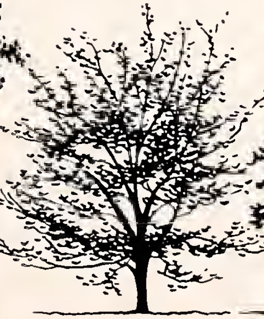
Pyramidal trees normally have a rigid, severe trunk, with the branches arising at right angles to it or bending in a sweeping manner and appearing to rise in layers. The outline is cone-shaped with enough regularity to accent the apex.

Umbrageous trees have an open-headed, round-topped habit of growth which forms a natural canopy, with limb structure and

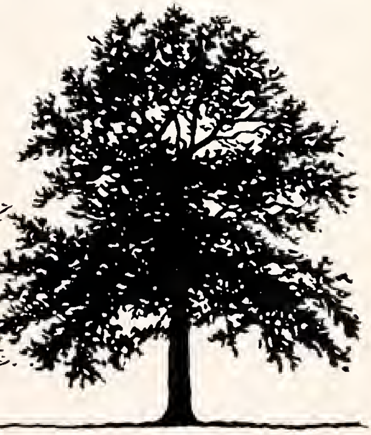
(*Continued on page* 63)



Sycamore
(*Platanus accidentalis*)
SPREADING
Other examples:
Horse-chestnut (*Aesculus hippocastanum*)
Sugar maple (*Acer saccharum*)
Yellow-wood (*Cladrastis lutea*)



Dogwood
(*Cornus florida*)
OPEN-HEADED
Other examples:
Redbud (*Cercis canadensis*)
Silk-tree (*Albizzia julibrissin rasea*)
Mountain-ash (*Sorbus aucuparia*)



White Oak
(*Quercus alba*)
OPEN ROUND TOP
Other examples:
Katsura-tree (*Cercidiphyllum japonicum*)
Umbrella magnolia (*M. tripetala*)
Kalopanax (*K. pictus*)
Black, willow, scarlet oaks (*Quercus*)

HERB TREES

A mediaeval art recreated

Bunny Mellon

©1965 by the Condé Nast Publications Inc. Courtesy of *Vogue*.

TOO much should not be explained about a garden. Its greatest reality is not reality, for a garden, hovering always in a state of becoming, sums its own past and its future. A garden, like a library, is a whole made up of separate interests and mysteries: among these mysteries are the herbs that are shaped into small trees.

A gardener plans at least eighteen months ahead. To keep a garden is to create, to care, and to hope. Years ago I experimented with growing rosemary, thyme, myrtle, and santolina into small standards in the shape of bay trees, varying from ten inches to three feet in height. When we began, as far as I know, they were unique in America, although I have read references to such herb trees in some of the old gardening books in my library.

This library, which includes manuscripts going back to the 1300's, amounts to a working collection for it is in continuous use. From it I have learned much about pruning, growing, and designing, for past methods were often ahead of ours.

These little herb trees, which recall the pure quality of a mediaeval monastery garden, began as an experiment to create something that would be to our culture, the culture of the Western Hemisphere, what the bonsai trees are to the Eastern; to produce a living plant that had the quality of an object.

As it takes about two years to make and shape an herb tree, we keep adding to this collection. By now we have a small forest. The original clipping for the myrtle trees came from Mount Vernon, where Mr. Robert B. Fisher, the head gardener, is generous and carries on the exchange of plants as once George Washington did. As the trees grow up, I give them to friends. A

ANOTHER hobby enjoyed by Mrs. Mellon is the raising of green flowers in both garden and greenhouse. "Green flowers are enchanted flowers," she says. "They give an impression of reflected sunlight, like the light of a Bonnard painting. Truly green, these flowers range from the colour of emeralds to the colour of moonlight on white flowers. Mixed with flowers in other more expected colours they add a secret formula of air and life."

Among the kinds she favors are the naturally green *Ixia viridiflora* and the orchids *Platyclinis filiformis* and *Cymbidium miretta* 'Glendessary'; also lady's-mantle *(Alchemilla major)*, besides such sports and deliberate hybrids as the tulip 'Artist', nicotiana 'Lime', and the lilies 'Green Dragon', and the Green Magic strain, as well as zinnias and auriculas.

While she has green flowers all year long, she does not display this color exclusively. "Neither in bouquets nor in flowerbeds do we use all green flowers together," she writes in *Vogue*, "for they deepen, brighten, and add subtlety to other colours. They have a mystery like true love that wants to hide but is betrayed by its own joy."

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Mrs. Paul Mellon with some of the miniature herb trees she has created, at her home in Virginia.

pinched leaf of rosemary, thyme, or santolina will bring the scent of a country garden into any room; some friends who cook keep their trees in the kitchen where the trimming of the tree becomes the flavour of the stew.

These trees, after many years, are still an astonishment and a joy, each beginning so improbably with a frail thread of plant lashed to a sliver of bamboo. To watch each one of them grow calls on all the resources of the gardener—resources which are surprisingly like those of the seaman who learns to live with faith, success, disappointment, and patience.

MULCH FIGHTS THE DROUGHT

Evidence at the Brooklyn Botanic Garden shows the value of mulching during a hot, dry summer

Eva Wolf

Reprinted from *Organic Gardening and Farming*, October 1965

WHILE the northeast endured its fourth consecutive summer of searing drought, and worried communities began placing more restrictions on water use, the helpful role that a mulch can play became increasingly apparent. A notable instance—one which we had an opportunity to view first-hand—is the attractive Brooklyn Botanic Garden, where regular irrigating has been curtailed completely in the midst of New York's drive to conserve water.

Late in July, Robert E. Tomson, Assistant Director, showed us around the many gardens and plantings—most of which were mulched. Tomson is enthusiastic about mulches—especially wood chips—for holding down weeds and conserving moisture. As we observed each garden, he was quick to rake aside the cover so that the dampness underneath could be felt as well as seen. He also remarked about the increase of earthworms in the soil where areas are mulched for many years.

Mr. Tomson calls attention to the texture of a pine bark mulch.

Tomson explained his preferences among materials for mulching, with wood chips heading the list. These, he indicated, are applied as soon as available, without any damage resulting to shrubs or trees. The leaves clinging to the fine twigs in the chips dry up quickly, and there is no leaching of any nutrients from the soil, since all the gardens are fertilized each year.

Sawdust is also high on the list. Before spreading fresh sawdust, some nitrogen is applied to the soil. Not only is plain sawdust used freely, but it is often mixed with peat moss to prevent that material from caking, or with cocoa-bean hulls to deter formation of slime-mold which may appear when these are used alone. The hulls also weather better when mixed with another material for mulching purposes.

The Brooklyn Garden's rose beds are dressed with buckwheat hulls, giving them a dark, handsome appearance. These hulls rate high, too, as effective mulch material, but at times it is difficult to procure them.

A more attractive mulch than wood

(*Concluded on page* 14)

MULCHES CONSERVE MOISTURE

Water-saving practices for dry regions and dry years

Robert S. Tomson

IN the New York area, the water that has fallen from the skies since 1961 is four feet less than normal. This is a precipitation deficit equivalent to the loss of one entire year's rainfall. Alarmed municipalities have seen reservoir supplies dwindle to a critical level. Non-essential use of water has been banned. Garden hosing has been prohibited.

Faced with the dual problem of conserving water and of maintaining adequate soil moisture in garden beds, thousands of hoseless gardeners began to consider the advantages of using a mulch. In addition to conserving soil moisture, mulches retard erosion, prevent surface runoff, inhibit the growth of weeds, reduce the fluctuation of soil temperature and, in the case of organic mulches, improve soil texture.

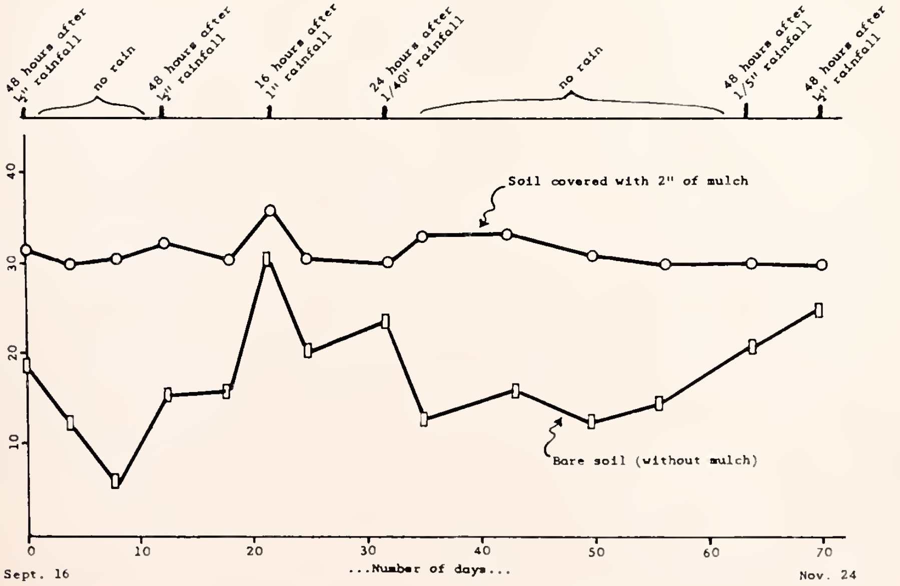
But it is the conservation of soil moisture that primarily interests gardeners; many wonder just how effective mulches are, and how they compare with each other.

In order to publicize the merits of using a mulch, an outdoor display case was designed at the Brooklyn Botanic Garden to illustrate the moisture-retaining qualities of mulches and to give instructions for their use. Then, to determine the extent to which seven different mulches* could help conserve soil moisture, field trials were conducted to compare the moisture content of soil be-

---

*Buckwheat hulls
Cocoa-bean hulls and
sawdust, 2-1 ratio
Crushed stone
Pine bark
Pine needles
Sawdust
Wood chips

SOIL MOISTURE: WITH AND WITHOUT MULCH



Louis Buhle

Instruction for the public in the use of mulches at the Brooklyn Botanic Garden

neath these mulches with that of unmulched soil.

The data collected during these trials, which extended more than two months (Sept. 16–Nov. 25) indicated that the seven mulches were almost equally effective in retaining soil moisture.

The results show that the relative moisture content of soil at a depth of 2 inches, and under a 2-inch covering of any of the seven mulches, averaged over 30 per cent. Also, the percentage of moisture remained comparatively stable throughout the trial period, varying only about 5 per cent.

In contrast, the relative moisture content of the unmulched soil at a depth of two inches was less than half that of the mulched soil, averaging only 14 per cent. The relative moisture in this soil fluctuated greatly, ranging from a low of about 5 per cent to a high of 30 per cent after one of the rainy spells.

The relatively low moisture content of unmulched soil (as shown by the lower curve of the graph) is particularly significant because a loam soil is at the *permanent wilting point* (the point when a selected test plant will not recover from wilting without the addition of more water to the soil) when the water content ranges from about 17 per cent for clay loam to about 5 per cent for a sandy loam. Thus, most plants, if grown in the low moisture conditions of the unmulched plot, would have expired without additional water. In contrast, soil plots covered with mulch consistently retained moisture well above the permanent wilting point, and plants grown under these conditions always had sufficient water.

This shows that, although a gardener may be hoseless, he is not necessarily helpless! By utilizing a mulch to conserve precious moisture in the soil he will have thriving plants despite any water shortage.

Four-inch mulch of wood chips on rhododendron. Soil under mulch remains loose and friable when surrounding soil is frozen. Thus, where winters are not too severe, moisture from melting snow is drawn into the evergreen leaves all winter.

SUMMER CARE FOR BROAD-LEAVED EVERGREENS

J. W. Oliver

©1965 by The New York Times Co.; condensed from *The New York Times* May 16, 1965

ERICACEOUS broadleaf evergreens are easy to maintain once located in a suitable soil and proper exposure. There are only a few simple upkeep rules, but they should be faithfully observed.

Before considering some of the do's and don'ts of care, the present condition of the plants in the landscape should be checked. Probably the commonest unfavorable condition is a light green or yellow color between the veins of the leaves. This is a fairly sure sign of iron deficiency, a problem that is not caused by a lack of iron in the soil but by an improper acid condition that ties up the iron in a form that cannot be used by the plants. The required soil acid condition is in the range of pH 4.5 to 6.

Iron Chelates

In a soil above pH 6, the tieup of acidity causes a similar lack in the sap of the plant. Below pH 4, the soil iron becomes non-functional. The once knotty problem of keeping the iron available is easily solved today with use of a material called chelated (key-lated) iron. The material can be applied in powder form to the soil, but for quicker results I recommend that it be applied as a foliar spray. There are several trade-named chelates on the market now.

If an ericaceous plant's leaves show complete yellowing, with brown tips and margins, the existence of a more complex chlorotic condition must be suspected. Such poor foliage may be caused by improper soil texture or poor drainage as well as lack of acidity. To correct conditions of this kind, it is best to lift the plants and rework the soil. Surface soil treatments are rarely adequate.

One of the most important—and misunderstood—points in the ericaceous care program is mulching.

A mulch applied in fall helps to keep summer's warmth in the soil. A winter mulch should be applied after the plant has become dormant and the ground has begun to freeze. But the best system is a year-round mulch. Simply add to it from year to year as necessary to replace material lost through decomposition.

There is nothing better than a six-inch mulch of oak leaves. If this is considered unsightly, substitute a two-inch layer of ground pine bark, pine needles or bagasse. Avoid tobacco stems or cocoa bean hulls; as these materials decompose, they become toxic to plants.

Moisture Supply

Watering is possibly the simplest operation of all, if the gardener will keep in mind that, given a soil of proper porosity, it is almost impossible to overwater ericaceous plants. Plenty of water, especially during dry spells, from spring through early August will assure a good set of flower buds for next year. After that, rainfall should be ample for the plant's health. Watering in late summer and early fall may stimulate new growth that will not have time to harden before winter sets in. However, make sure that the plants go into winter with plenty of soil moisture.

Nutrients

Fertilizing is fairly simple, too. As organic mulches decompose, they add fertility to the soil. But the bacteria that perform the decomposition draw nitrogen from the soil. Although this nitrogen is later restored to the soil, it is advisable to add some fertilizer to prevent temporary nitrogen deficiencies. This should only be necessary for about two years after the first mulch is applied.

Ammonium sulfate, at about three pounds per 100 square feet, should be spread over the mulch in spring not later than June. Later feeding may stimulate growth beyond the normal growing season.

Be careful to keep strong fertilizer at least three inches from the plant stem. Cottonseed meal at the rate of five pounds per 100 square feet is a good acid-reacting nitrogenous fertilizer. It is slow-acting and less likely to be harmful if used in excess. Never apply more of any fertilizer than the package recommends.

Never cultivate around ericaceous broadleaf evergreens. The majority of roots are near the soil surface. Mulches will prevent most weed growth; the few weeds that get through can be pulled out by hand.

Ericaceous plants need little if any pruning, except to remove dead or protruding branches. These evergreens should be allowed to grow in their own natural form. The preferred time for necessary corrective pruning is early spring, before new growth starts. Late pruning, like late fertilizing, may stimulate unwanted growth.

Controlling pests and diseases generally varies from plant to plant. The lacebug, for example, attacks many types, but is particularly hard on *Pieris japonica.* Complete eradication is usually achieved with three applications of a malathion spray—one in spring when the threat of freezing is past, the second just before bloom, and the third just after bloom. Be sure to thoroughly spray the undersides of all leaves, for that is where the bugs concentrate.

Whitefly Control

The azalea whitefly is a special pest of certain types of azaleas. The whiteflies secrete a honeydew on the leaves, upon which a black fungus (sooty mold) then grows. The whiteflies do not kill the plant, but they cause a reduction in leaf size, a general unthrifty growth and poor flowers. Whitefly infestations can be controlled but seldom eradicated by malathion sprays. Many experienced growers have discarded Indica alba rather than constantly battle whitefly.

Mites, scales and weevils also attack ericaceous shrubs. The control of these, however, is often too complex for the amateur gardener to attempt without professional advice.

In addition, there are fungi that attack these ornamental shrubs. Some shiny-leaf azaleas are susceptible to a fungus that causes a leaf and flower gall, especially during wet weather. The fungus can be controlled with a weak Bordeaux mixture, but for the average small garden the simplest control is to pick off the affected plant parts and burn them.

* * *

(*Continued from page* 10)

chips, Tomson believes, is one of pine needles. When the needles are dribbled in place through the fingers instead of being dropped in a heap or shoveled on, the appearance is more natural looking and worth the extra time. One objection to pine needles is the small amount of moisture that penetrates them. This may be due to slowly decomposing resin that remains in the needles, Tomson observes.

Where an extra decorative touch is needed, areas are mulched with small stones of various hues. These are used attractively at the edge of sloping gardens, in the Japanese gardens, and in the herb and formal gardens. The stones, broken crocks, ground marble dust, etc., form colorful patterns and serve to accentuate the plantings.

The mulches are applied a couple of inches thick on most areas in the early spring after the beds are fed and watered. Sometimes another layer is added if needed.

In Sacramento, California

A SCHOOL BOTANIC GARDEN

At a grade-school arboretum sponsored by the Parent-Teacher Association and developed largely by the pupils, a group is getting acquainted with mountain-mahogany, one of California's native shrubs. Many classes use the acre of ground with its plant and animal life to supplement their indoor lessons in science studies, art and other subjects. The arboretum is at Bowling Green School, Sacramento.

A circle of benches serves for outdoor discussion on fair days.

A blind enables students to watch birds and other wildlife.

Part of the herb garden at High and Low, Mrs. Fox's Westchester County home

THE AGING GARDEN

Helen M. Fox

Condensed from a chapter in *Adventure in My Garden;* Crown Publishers, New York.
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IN any garden the desired picture or pictures are always in the process of being both created and maintained, for a garden is not static like a statue or a painting but a changing, living composition. To keep the picture in focus, the watchful gardener must be constantly employed either in holding his garden within bounds or in slightly varying its population. Although the composition will follow the lines of the original plan, the details will change, and that is the fun of it. The successful gardener must be an artist perpetually at work, not with a brush or chisel, but with saw and clippers, spade and trowel, for he must be forever thinning, pruning, dividing and transplanting.

It is generally conceded that gardens when young, with their trees low, their shrubs spindly, the lawns still hesitant, and the perennials separated by expanses of brown earth, are less satisfying to the eye than old mellow plantings. It takes time for a picture planted in the garden to materialize, to achieve an effect in early spring of banks covered with snowdrops, drifts and sweeps of blue scillas under yellow-flowered corylopsis and forsythias or, later, to have rounded lilac bushes heavy with fragrant trusses while the carpet under them is enlivened with Star-of-Bethlehem. In time there can be in sunny spots, expanses of fragrant thyme and great clusters of lilies and, in the fall, bushes of cotoneasters, barberries and viburnums so extensive they produce not merely patches but bold swaths of red, orange and yellow fruit.

Yet after some years of careful cultivation and feeding, a garden will someday reveal its age—when the clumps of bulbs are crowded, when the viburnums have attained a height of twenty feet, when shrubby magnolias have become full-sized trees, and native rhododendrons have grown much too tall for their position. Yew, at first only a nicely shaped dark green accent, will have threatened by this time to become enormous and out of all proportion to the terrace or border, while box, growing wide and high, will have invaded the beds it was meant only to edge. . . .

Pruning to maintain the shape and pattern of trees and bushes must be done each year. . . . While the annual pruning is going on I keep humming to myself, 'Cut out the old and cut it low'. It is unwise to cut back the tops, for that results only in an increase of small branches and provides a twiggy growth at the top of the tree or shrub, and provides less bloom just where flowers are most wanted. . . .

Among the well-known shrubs which are pruned by cutting old wood close to the ground are lilacs, honeysuckles, mock orange, species and climbing roses. Some shrubs, such as deutzias and some of the azaleas and spireas, make a twiggy growth or miniature thicket. These can be divided by cutting away part of the shrub with a spade. If the severed part has roots it can be replanted.

As a garden ages there is, of course, a natural elimination and replacement of certain plants. Almost every garden begins with too many shrubs of one kind and not always the choicest varieties. Moreover, even the best planned garden is often too full. This close planting is done in order to obtain a lush effect as quickly as possible. When the plants become too crowded and some must be taken out, the qualities of all should be examined and the inferior sacrificed in favor of superior material.

As the years go by, the gardener will often find that within the range of a single species or even of a variety, some specimens prove far handsomer than others, and he will learn to select the best-looking. Often I make cuttings of the handsomest forms and do away with the others. Thus, with the passing of years there will be fewer, and at the same time, finer plants, and the effect of the whole garden is likely to be simpler than it was at the beginning. Each plant will then stand out prominently in all its beauty. The longer one gardens, writes or paints, the simpler one's means of expression becomes. To my mind, simplicity is the ideal to be sought in every artistic endeavor.

There will be other subtle changes in the aging garden. It may be found, sometimes entirely by accident, that azaleas do better on a slope in front of a stone wall than they did where they were planted originally, on a dry bank behind a hawthorn hedge. Again, it may be discovered that heathers, helianthemums and penstemons are rampant on a bank facing southwest where previously junipers had grown too large to keep. Iris may become too crowded in the border but found to increase and thrive on a rocky slope where formerly there was a planting of too many spireas. . . .

Some plants may be discarded altogether. It may be found that more yellow is needed, or more rose, or blue, and one suddenly discovers the beauty of gray-toned foliage plants. Bulbs, too, must be thinned, or they become so crowded their growth is checked. . . Plants such as forget-me-nots, which have spread out on the borders of my pond, are encouraged to increase, although they must be thinned. But certain self-sown plants in the garden must be dug up and destroyed quite ruthlessly if they are not to preempt too much valuable space. Among these are *Digitalis lutea, Campanula rapunculoides,* Johnny-jump-up, wild strawberries and violets as well as almost all the ground covers.

Shade may dictate changes in plantings. As trees grow they cast more shade, and their roots require more food from the surrounding beds. Where there may once have been sufficient sun for carnations and poppies, now there may be semishade, where campanulas or primulas can flourish instead. And some years later there may be so much shade that ferns, pachysandra, violets or bloodroot will replace them in the garden picture.

STEWARDSHIP

A challenge to today's owners of woods, fields and waters to make tomorrow's communities more livable

The excerpts below are from the recently published book entitled *Stewardship,* which has been prepared by the professional staff of the Open Space Action Committee, 205 East 42nd Street, New York, N. Y. 10017. The aim of this group is to assure the permanent setting aside of significant tracts of open space throughout the New York Metropolitan Region.

Such action need not be confined to the vicinity of New York. Wherever urbanization is threatening natural areas and other desirable land or water not yet overrun with man's structures, there is a place for "stewardship."

Copies of the book, which describes how some landowners have already helped preserve space and how land may be donated, developed, or managed in the interest of its conservation, are available from the Committee at three dollars (paper-bound) or six dollars (cloth).

THE idea of this book is simple. In the New York Region, there is and will continue to be a severe shortage of permanently preserved open space—the land needed for recreation, the preservation of natural processes, and sheer visual amenity.

While various levels of government can be expected to put more and more money into the acquisition of open space, such funds will continue to fall far short of the mark even as they increase. The public response to the need for open space is almost by definition too late; it is missed only after it is gone. And the cost of land is bound to rise more steeply than the governmental appropriations for its purchase.

But there is a unique opportunity for private action which, if seized, can powerfully augment governmental open space programs, and just might make it possible for this generation to pass along to its children a region approaching what we would like it to be.

This opportunity could be called "Stewardship." It is an opportunity available to a very small fraction of our metropolitan population—probably no more than 10,000 individuals, or .06%.

These are the private owners of what is left of the open land in this region, land which comprises most of the remaining woods, fields, streams, lakes, seashore and salt marsh. In twenty-five years, the use patterns of this open land will have been set. The look of the region depends on the decisions it owners make today.

"Stewardship" may seem an abstract concept, but there are many means for its concrete expression. An owner who is philanthropically inclined might donate land for open space use to a park authority or a conservation organization. A person who wishes to sell his land might participate in the design of a subdivision to assure that some valuable open space remains. The estate owner who would like to continue to live on his property just as it is or bequeath it intact to his heirs, might convey an "open space easement" to preserve the open character of his land, remove the pressure for development, and stabilize his taxes at a level he can afford.

Only one assumption is made: that most of the owners of open land in this region already have a sense of stewardship. One might think it necessary to

200-acre Teatown Lake Reservation in Westchester County, New York, was donated by the family of Gerard Swope to the Brooklyn Botanic Garden, which was able to accept it under existing statutes, whereas the county at that time could not. The entire reservation is thus preserved as a natural area.

except from this the land speculator to whom a quick profit may be most important, but even among speculators, both professional and amateur, there are many with vision who would like to see the land used properly as well as profitably.

A concern over wholesale landscape destruction is beginning to show up in state and federal legislation. Among federal accomplishments are the Land and Water Conservation Fund, the open space grants of the Urban Renewal Administration, plus acquisitions such as Fire Island and Tocks Island (in the Delaware River, near the tri-state area). New York State passed a $75,000,000 open space bond issue in 1960 and in 1962 added $25,000,000 to it. New Jersey voted $60,000,000 for its Green Acres Program. Connecticut sets aside several millions yearly for grants to municipalities for open space acquisitions. But, withal, such exciting developments will not in themselves regain a paradise, even if the metropolitan region got a share of the funds proportionate to its population, which it doesn't.

The financial mathematics are grim. Planners estimate that ideally 25% of the land in a given community should be in protected open space uses. At the current rate of urbanization in the New York Region—some 2,000 acres per *week*—we will need then, at a minimum, some half million acres set aside in the next 20 years just to keep pace with new development. The cost, using a $1,000 an acre price as a nearly absurdly conservative average would be $500,000,000, and this doesn't count the cost of bringing older communities up to standard. The Regional Plan Association suggests that altogether $1,900,000,000 is needed for open space in the metropolitan area.

Most observers believe that if the open space problem is to be solved, it will polarize on individual initiative at the local level. State and federal grants are a powerful impetus to public action, of course, but much of the origin of action must depend in large measure on the initiative of those who see the problem clearly and are in a position to do something concrete about it. Those who, in short, are *able* to act on the open space problem: those who, in fact, *own* the open space land.

How many such people are there? And what will they do? The quality of a region depends on the answers to these questions.

THE LATH HOUSE—A SHELTER OF MANY USES

Tom Powell

Condensed from the *Bulletin* of The Horticultural Society of New York, Inc., June 1965

David Ives Mackie

Prized house-plants are protected through the warm season in this airy shelter, which also serves as a summerhouse for its owners.

A LATH house is a multi-use structure. Its primary purpose, of course, is to protect plants from the summer sun, but when properly designed and located, it can be one of the most enjoyable features of the garden.

In deciding the design, size, placement, and so on, of your lath house, consider these factors:

First, your plants' needs. Conventional lath in 1½- to 2-inch widths, spaced the width of a lath apart, affords ample protection from strong sun for many plants. For additional shading, many vines are suitable for training up and over a lath structure. A solid roof of translucent or opaque plastic can be used to provide varying degrees of protection up to full shade, as well as sheltering plants which might suffer if rainfall is excessive. Bamboo or reed porch shades or a plastic mesh such as Saran (used for greenhouse shading) can be utilized to break the wind, and pulled up on rollers when not needed.

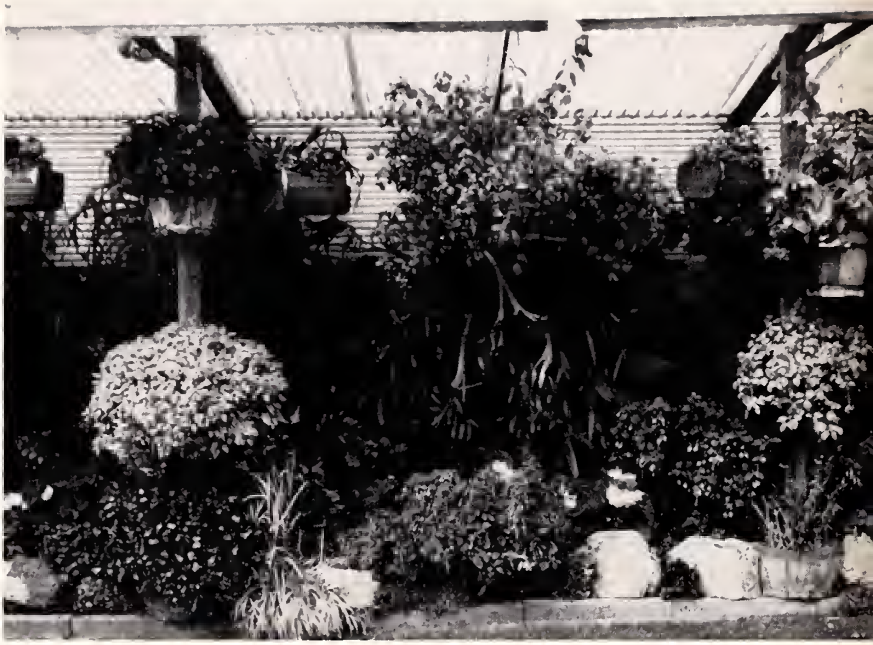
Second, take into account your own special gardening needs. Do you need a work or storage area? Do you have a love for shade plants but no trees to shade them? If you grow humidity-loving plants such as begonias or orchids, a cement, stone or gravel floor that can be damped down frequently with a hose is an asset. (For less work, you can install an automatic mist system, activated by a time clock.) A moist atmosphere will be helpful for flats of seedlings and cuttings as well.

To reduce costs, look into the possibility of using a wall of your home or garage, the end of your greenhouse, or a suitable fence, as one wall of your lath house. Perhaps a narrow side yard could be completely lathed over, the house wall forming one side of the structure, the fence or wall on the property line the other. But check the local building code before erecting anything close to your property line.

A lath house attached to a greenhouse, for example, might have a common work area for repotting and similar chores. Part of a lath house roof could overhang the patio to provide a shaded area on hot days, with staging for plants and even a fountain to add to the cool effect.

The lath house that becomes a greenhouse in winter is a really versatile structure. These are most frequently seen in the South, but ingenuity can produce creditable adaptations for cold climates.

Most practical for this purpose is a lean-to lath house attached to a dwelling, with a door and one or more windows which can be left open to allow heat from the house to warm the lean-to. With the advent of cold weather, the structure is



The "lath" in this cool summer shelter for tender plants consists of spent fluorescent tubes, which reduce both light and heat and provide ventilation.

Hertha A. Benjamin

covered with a flexible clear plastic, preferably the long-life type such as Mylar. This can be mounted on both sides of any conveniently sized wood frame; stock 4- x 5-foot sash is excellent. These are nailed to the rafters and side supports.

Unless supplementary heating in the form of an electric heater or larger device is provided, probably only cool-growing plants will be suitable, for heat from the house is unlikely to maintain more than 50 degrees in the structure on sub-freezing nights. However, winter sun can cause extremely high temperatures in a plastic or glass house, so a sliding sash or similar arrangement for ventilation should be provided.

Some hints on design and construction:

A creosoted redwood sill makes a satisfactory foundation for a small lath house, but concrete is recommended for permanence in larger structures.

Redwood, cedar or cypress are best for corner posts and studs, but many other woods will perform well if treated with wood preservative.

Wood roof beams can be steamed and shaped into intriguing shapes for a modernistic design.

If you plan to hang plants, use 2 x 4's or larger lumber for joists. (Hanging pots with fishing leader swivels, by the way, makes it easy to turn the plants for close viewing.)

Lath comes in 4-, 6-, and 8-foot lengths; design your structure to use multiples of these and you'll save work in cutting to fit.

Alternating different widths of laths or any other type of wood strips gives a pleasing effect.

An overhanging roof will give you additional shade outside the shelter for plants that dislike the midday sun.

Don't hesitate to use unusual materials. Spent fluorescent tubes, set in wood frames and spaced $\frac{3}{4}$ inch apart, make a surprisingly attractive covering. Being vacuum tubes, they insulate and thus provide extra coolness.

A well-designed lath house can have architectural significance, provide an outdoor living room affording pleasure through three seasons of the year, and greatly improve the growth of many plants.

PROPAGATING PLANTS ON THE WINDOWSILL

Plastic bags make miniature greenhouses

TO assist home gardeners in propagating ornamental plants, horticulturists of U.S.D.A.'s Agricultural Research Service suggest an inexpensive method for rooting cuttings. This method is based on the practice widely used by nurserymen and other plant specialists of rooting cuttings under a plastic sheet. Instead of buying a sheet of plastic, the home gardener can use plastic freezer bags. A step-by-step method is illustrated here.

THE first step in constructing a propagating unit in a plastic bag is to get fibrous peatmoss. Screen it through a quarter-inch wire mesh to remove twigs and other large fragments. Next (*above*), mix two parts peat with one part clean, salt-free sand. After thorough mixing, add just enough water so that when a handful of mixture is tightly squeezed, only a few drops come out. Place enough of the mixture in a 2-quart freezer bag to make about 4 inches of rooting medium. The bag should be water-tight.

Cuttings should be of the current year's growth. They are ready for rooting if they snap like fresh string beans when broken between the fingers. Softer growth is too young; tougher growth is often too old.

Make cuttings 4 to 6 inches long. Remove leaves from lower third to half of each cutting. Make a straight cut across base of twig with a sharp knife, then slice a thin sliver (about an inch long) from lower end of cutting.

Moisten and partially dry base of cutting, then dip in rooting hormone powder to quicken development of roots (page 23, *left*). Make a hole with a pencil 2 to 3 inches deep in the moist sand-and-peat mixture in the plastic bag (page 23, *center*), insert cutting, and press mixture firmly against it. Add other cuttings, spacing them so that their leaves barely touch. Sprinkle lightly, just enough to wet the leaves, then close the bag tightly with a rubber band. Set the bag on a

windowsill with a north exposure (*above, right*).

No more attention will be needed until roots have formed, which should be in about two months. If on examination a number of roots ½ to 1 inch long are then in evidence, the cuttings can be transferred to soil in pots. Before transplanting, however, condition cuttings to a drier atmosphere by opening the bag a little more each day for about a week. Meanwhile, keep the mixture moist.

Fresh-looking cuttings that have not rooted can be kept in the bag for further development. They should be inspected every two weeks.

STRAWBERRY FACTS

©1965 by The New York Times Co.; reprinted from *The New York Times*, April 11, 1965

George L. Slate

"CLIMBING" strawberries are a fallacy. Strawberry plants do not climb.

All strawberries produce runner plants. These are attached to the mother plant by stolons several inches long, which lie flat on the ground. To achieve a so-called "climbing" effect, recent promotions advise the home gardener to tie the runner plants to a trellis. The disadvantages of this are several.

If the runner plants are attached to the trellis, they do not produce roots as do the plants that are prostrate on the ground. The whole trellised system of plants is forced to absorb nutrients and water supply through the root system of the mother plant, a most inefficient arrangement. When the runner plants lie on the ground, however, each develops its own root system for absorbing water and nutrients.

Runner plants on a trellis will die during the winter as it is not feasible to protect them. If they are removed from the trellis and laid on the ground, they either die or are so severely winter-injured, they are worthless. Strawberry plants must have a well-developed root system in the soil to live through the winter.

So-called "climbing" strawberry plants are not produced from virus-free plants. Strawberry plants, to be virus-free for any length of time, must be grown from special foundation stocks according to rigid specifications to keep them virus-free. Such plants are usually more vigorous and productive than plants of unknown quality which are not produced from virus-free stocks.

Jeannette Grossman

Wisteria grown on a trellis helps to keep house cool in summer.

PLANTS TO CONTROL TEMPERATURES

R. R. Thomasson

©1965 by The New York Times Co.; condensed from *The New York Times,* April 11, 1965

TREES, shrubs, vines and grass that grow around a home have a marked influence on the temperature, both indoors and out. They can be arranged to make the home cooler in summer and warmer in winter. Their cost is not likely to be any greater than if appearance alone were considered.

Plants reduce summer temperatures through the cooling effects of transpiration as well as by providing shade. In winter, the bare branches offer little obstruction to the sun. Trees and shrubs may help in winter as well as in summer by modifying the flow of air.

The American Association of Nurserymen has found that a tree located to give maximum shade for a house may make a difference of 20 to 40 degrees in wall and roof temperatures. An unshaded roof permits the buildup of intense heat in the attic, heat that comes down into the house all day and much of the night, even after outside temperatures have cooled.

The location that usually gives shade where it is most needed during the hottest part of the day is near the southwest corner of the house. (To find the best spot for the tree, observe the shadow of a stake or pole placed in the general location of the planting site.)

Protection from the sun will be much more thorough if the tree is tall enough to shade the roof. The lower branches need to be high enough to allow free passage of air.

When trees are yet to be planted around a recently constructed house, the need for shade prompts the selection of rather quick-growing species. Some trees that might be used are thornless honey locust, green ash, Buisman elm, pin oak, tulip poplar and sycamore. Sycamore is a rapid growing tree but it may create a litter problem. Honey locust, another rapid grower, is beautiful but casts a rather light shade.

For walls that cannot be shaded by trees, or while waiting for trees to grow, there are vines that will insulate against the sun. If the house is of brick or masonry, Boston ivy, euonymus or Virginia creeper may be used. Virginia creeper is somewhat coarse. If it is a frame house, the vines will need to be grown on a trellis. Clematis and wisteria are two suitable perennials.

Patios or other paved places in direct sun add tremendously to the heat of an area. Properly placed trees will help overcome the problem. A vine-covered pergola may be even more effective and much more quickly achieved.

A good sod will do much to reduce the buildup of heat around the house. As with trees and shrubs, the transpiration of moisture taken up from the soil has a marked cooling effect. The more sod the air passes over before reaching the house the cooler it will be. Shaded sod is even more effective than sod in the sun. Vigorous grass cut at least an inch and one-half is much more cooling than is bare ground or even closely cut sparse sod.

Plantings to direct air currents alleviate heat in summer and cold in winter. A windbreak or hedge located for protection against winter winds can help maintain a warm house and even reduce a fuel bill by 20 per cent. (A windbreak is effective in reducing wind velocity for a distance of 10 times its height; a 12-mile-an-hour wind with a temperature of 32 degrees will require the same amount of fuel as a three-mile wind with the temperature at zero.) Windbreaks will not interfere with the movement of summer breezes for the breezes usually come from the opposite direction. In fact, plantings can be arranged to create a sort of breezeway to funnel summer air where it is most needed.

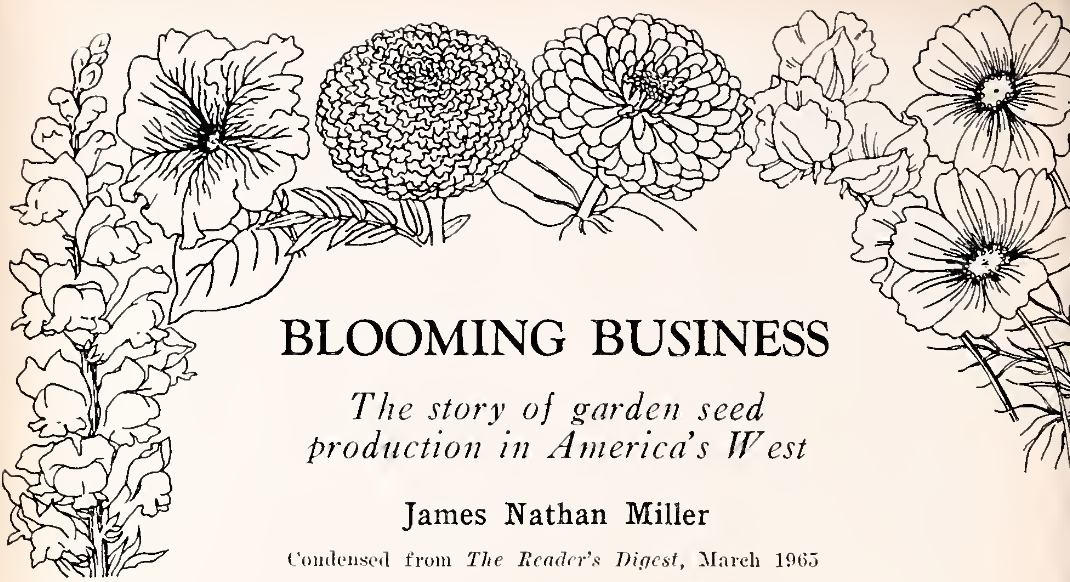
PLANT INJURY UNDER CERTAIN NUT TREES

Guenther Stotzky

AS is well known, many plants fail to grow beneath black walnut trees (*Juglans nigra*). Although very little research has been conducted with butternut trees (*Juglans cinerea*), a communication from Mrs. J. P. Zollinger of Kingston, New York, indicates that much the same effect is to be seen.

The cause of this injury is suspected to be the chemical juglone. Both black walnut and butternut contain large quantities of hydro-juglone in the root bark, leaves, and fruit flesh. This compound is not toxic to plants, but, upon exposure to air, it is rapidly converted (oxidized) to juglone, which is toxic.

Laboratory experiments with synthetic juglone have shown that this substance is strongly toxic to, for example, alfalfa and tomato plants. Field experiments have indicated that inhibitory compounds are probably not released from the roots, but that these compounds do diffuse into soil from the above-ground parts, especially from the leaves. Water dripping from *Juglans* trees contains these growth-inhibiting substances, as do the fallen leaves. The latter also contain other growth-inhibiting substances, probably tannins, which are washed out into the soil. This suggests that one way to minimize the damage to other plants from these trees is to remove fallen leaves immediately.



BLOOMING BUSINESS

The story of garden seed production in America's West

James Nathan Miller

Condensed from *The Reader's Digest,* March 1965

THE flower seed-growing center of the United States is the Lompoc Valley, halfway between Los Angeles and San Francisco. Four of the five major seed-growing companies do most of their growing here.

Fly over the valley during August and you see an incredible mile-wide, ten-mile-long bouquet: five acres of lemon-yellow marigolds, hundreds of acres of sweetpeas, stocks, cosmos, asters, petunias—everything from ageratum to zinnia growing in lush profusion. At harvest time truckloads of faded blooms are dumped into the cleaning mills, where specialized beaters, whirlers, vibrators and gravity devices separate seed from chaff. So selective are these machines that 99.5 per cent purity is run-of-the-mill; with some seeds, 100 per cent.

In a huge field of snapdragons at Lompoc, spaced along the side are beehives—six to ten an acre. Stand in the middle of the field, and the sound is that of a powerhouse with all the dynamos going.

Why bees? The answer is that the product of these gardens is not flowers but *seeds* containing embryos of future flowers—and the only way to produce embryos is by the sexual mating of male and female organs. As the bees swarm through the field in search of nectar, they are constantly rubbing against the powdery pollen of the male stamens, then buzzing off and inadvertently brushing it onto female pistils. That does it. Seed production through "open pollination" is the way nature has always perpetuated plants.

But some of the Lompoc plants are guarded by tall cloth-shrouded cages that stick up like ghosts in the fields. Why?

Nature continually turns out mutations, or "sports." When a *good* freak is spotted, it is caged to protect it against the miscellaneous working of the bees, then pollinated carefully by hand to perpetuate the line. The seeds it produces are worked over by plant breeders for years, in thousands of combinations. Hopefully, one or two of the several hundred mutations discovered this year at Lompoc will be the ancestor of a new flower that, five or ten years from now, will be given a hard-sell name and listed in the big seed catalogues.

This "line selection" breeds purity of color into open-pollinated plants by inbreeding. But flowers begin to get smaller blooms and weaker growing habits as they are isolated for generations and mated among themselves. Thus the dilemma: the closer inbreeding brings a flower to purity of color and uniformity of bloom, the weaker it tends to make the plant. There is one escape from this dilemma: hybridization.

The acre of greenhouses high in the Colorado Rockies operated by Charles Weddle, breeder for the Pan-American Seed Co., demonstrates how it's done. The greenhouses are tightly screened, and *all* the flowers here are protected against bees; for they must not be random pollinated, but mated according to precise plans.

The girl working at the long row of petunias may perform thousands of such matings daily. She carefully pinches off the top of an unopened bud, exposing stamen and pistil; then with tweezers snips off the tiny pollen-bearing male stamens. For this flower is to be a seed-bearer, and the danger of unplanned self-fertilizing must be eliminated. Then the girl dips a camel's-hair paint brush into a glass tube of pollen collected from the prescribed mate and delicately paints it on the flower's tiny pistil.

Strangely, the work starts out in what seems precisely the wrong direction—with the most intense inbreeding. The girl "sibs" a plant—mates it to a sibling (brother or sister) plant. She "back-crosses" it to its father or mother. And she even "selfs" many of the plants—simply rubs stamen and pistil together within the flower, mating it to itself. This process is continued until the desired traits are fixed and uniformity is attained.

If you look at the plants after several generations, you realize why laws prohibit incest among humans. Look, for instance, at the plants produced by inbreeding the beautiful salmon petunia, 'Maytime', for five generations. They're miserable specimens—weak, yellow-leaved, small-flowered.

Why take all this trouble to develop such a sorry plant? The answer is the new 1965 award-winning petunia, 'Apple Blossom'—a huge-flowered, explosively growing new variety. Weddle produced it by mating the scrawny inbred descendants of 'Maytime' to equally scrawny inbred descendants of another petunia, 'Cheerful'.

'Apple Blossom' is an F_1 (first filial generation) hybrid—the offspring of two distinct inbred lines—and the magic that produced such a paragon from such unpromising parents is called *heterosis,* or hybrid vigor.

When bees do your pollinating, you pay the world's lowest agricultural wages. But to produce F_1 petunias you hire humans. Six thousand hand operations are needed to collect the pollen, hand-emasculate, hand-pollinate and hand-pick the 1,500 flowers that produce an ounce of seed; and the cost is high. There are 3,000 of the old-fashioned, open-pollinated petunia seeds in a 25-cent packet. There are only 200 F_1's per packet, but the price is from 50 cents to $2. In fact, F_1 seed costs far more than platinum; 'Apple Blossom' retails at $46.25 for *one sixteenth of an ounce.*

Why not eliminate the human-labor cost by planting precisely-alike F_1 flowers in an isolated field, releasing the bees, and then selling the *second* generation, or F_2 seeds? The trouble is, while the seed of the first generation comes absolutely true and uniform for every plant, the laws of genetics catch up on the second generation. The genes "break up," reaching back into the plant's ancestry to produce mixtures of forms and colors.

Thus, in Weddle's words, "There's no choice but to save your two inbred lines, and for every year's new seed crop go back to them and hand-pollinate again."*

What has it meant to our gardens? In both open-pollinated and hybrid varieties, stunning new colors and shapes have appeared. Petunias, which 30 years ago came in only four shades, have blossomed into an array that goes from purplish-blue through snow-white to deep scarlet. The old coarse-colored orange or yellow marigold has puffed out in size like a great sponge and spread its colors over a range of the most delicate lemons and limes.

Growing habits have been radically improved. The new F_1 snapdragons, intro-

(*Concluded on page 56*)

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*A few successful F_2's have been produced by mating two inbred varieties of almost identical appearance. The genes then "break up" to produce similar-looking flowers, which are less uniform but do possess hybrid vigor.

At the Chelsea Flower Show in England

TIME FOR A CHANGE

Edward Hyams

Condensed from *New Statesman*, London, England, June 4, 1965

YEAR after year the Royal Horticultural Society's Chelsea Flower Show is greeted by the press with raptures. There is no real criticism, everybody congratulates everybody else and not a carping voice is to be heard. I should like to do a spot of carping.

Has anyone ever pointed out, for example, the misleading nature of many of those displays which are planted as gardens and not just arranged on stands? Effects are obtained by planting out forced plants which would never flower together at the same season in your garden; by planting out herbaceous perennials which have been fed and forced to a size and floriferousness which does not happen in real gardens; and by using young, therefore small specimens which, if really planted in the situations given them, would within two or three years be an impossible size, throwing the whole design out of true and being, very often, a serious nuisance. These practices can be condoned on the ground that visiting gardeners know perfectly well that a garden could not really be made that way and the nurseryman's object is simply to display the qualities of the plant in an agreeable fashion. But the RHS is a learned society; it has an important scientific side and much scientific standing: displays made under its aegis should surely be technically sound and not merely pretty pictures which are also misleading.

Secondly, the repetition, year after year, of the same show formula is very boring and indicates mental stagnation. I suggest that we need a radical change and that it should be brought about something as follows. Let the RHS plan the whole show as an integral work with two objects clearly in mind: the display of good garden plants; and the display of good garden design and practice, especially for the small garden, the public garden and the newly important kind of garden used to screen, or to improve the surroundings of, industrial buildings. Those nurseries and other institutions wishing to show would then each be asked to undertake a particular aspect of the general theme. This would, among other advantages, eliminate that screaming chromatic outrage which is always an offense to the eye—the infamous 'riot of colour'.

At London's famous Chelsea Show.

Much more difficult to manage would be the matter of taste. Since there are presumably people who actually like the hard-coloured, coarse-formed and bloated begonias, the blown-up calceolarias which look like the detritus of a serious abdominal operation. These repulsive objects must be displayed. But surely something could be done, by careful pre-design of the show as a whole, to obviate the worst offences.

It is time something was done to break through that complacency which is such

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At New York's Flower Show

WINTER NIGHT'S DREAM

Phyllis Cobbs

Condensed from *Patent Trader*, Mt. Kisco, New York, March 11, 1965

YEAR after year, I resolve to pass up the Flower Show, and year after year it lures me back as the pitcher plant lures the fly.

On principle I am opposed to flower shows; contra-seasonal flower shows, that is. A daffodil display in April or a rose show the second week in June is something else again, but a flower show in early March is like a really fine day in the middle of January—a phenomenon in every way contrary to nature.

And yet, there I am back in the Coliseum, deluding myself for a few brief hours into believing that March, in New York, is really the first month of spring. New Year's Day may be the time for good resolutions in other departments. For gardeners, it is the second week in March.

The first resolution relates to the annual spring clean-up and it is an easy one to make in the immaculate milieu of the Coliseum. The visitors are untidy beyond belief, dragging their scarves and winter overcoats and shopping bags overflowing with petunia seed and miniature rosebushes, but in the gardens there is scarcely a blade of grass out of line. These neatly contained plots are unsullied by crab grass and poison ivy. Even the "woodland" settings, with their birches and evergreens and gentle waterfalls, are about as genuinely naturalistic as an Italian movie starlet. The Flower Show is almost wholly dedicated to the green world, but it is a world in which the gardener never for a minute loses the upper hand. What some people can do, other people can do; it is easy to visualize our two-plus acres of Westchester woodlot, all neatly trimmed and terraced.

After the clean-up comes the planting. This will begin almost any day now with flats of choice vegetables and tender annuals and end, sometime next November, when the last tulip and lily bulb have been stowed away against another spring. Mercifully, there is a three or four month respite from November to March, which is why so many gardeners survive to dig again.

When the dream approaches reality, the gardener comes into his own, and it is this possibility, of course, that lures him back to the Flower Show, year after year. He sees a new plant and it is a case of love at first sight. The vision of the plant as it will look at the corner of his terrace haunts his dreams in the cold, wet nights of winter and early spring.

This has happened to me a couple of times. One year it was a rhododendron named 'Scintillation', and another time a weeping crab apple named 'Red Jade'. I pursued them with all the enthusiasm of one of King Arthur's knights on the track of the Holy Grail. As is often the case with such chivalrous quests, the reality at first proved disappointing. The first year the buds on 'Scintillation' blasted, and it was four years before 'Red Jade' deigned to bloom at all.

The year the menfolk threatened to chop it down for kindling, the crab apple finally put forth a couple of modest blooms and I was vindicated. Such is the substance of a gardener's winter dreams—not very substantial, but enough to keep him dreaming.

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(*Continued from page* 28)

a distressing attribute of long-established English institutions, and to try a new formula for this world-famous show. The old one has worked well for a very long time. But an institution either grows and changes with the community or, appearances notwithstanding, it is dying.

RIVER OF SAP

Rutherford Platt

Condensed from a chapter in *The Great American Forest* by Rutherford Platt. Prentice-Hall, Publishers. Englewood, New Jersey, 1965

A TREE stands motionless. It is nerveless and silent, its trunk seems solid and it contains no organs in the usual sense. Yet a tree is alive from the cap of its deepest root to the tip of its highest twig.

The key to a tree's efficiency as an organism lies in the unique fact that only about one per cent of the bulk of a tree's body consists of live cells that require constant maintenance. Comparatively little energy is expended in doing a big job. Only a few cells, relative to the size of the tree, must be supplied with food, water and oxygen. . . .

Although wood cells are not alive, they are entirely different from ordinary dead organic matter. They do not collapse into a shapeless mess. They hold their shape, and they are precisely fitted together to make an operating mechanism which does not require food and servicing like living cells. Barring accidents, wood cells playing their roles in a tree's body are shielded from the bacteria of decay by the sheath of bark; they can endure for centuries without weakening. . . .

A tree's diagram is often compared to that of a river system. On a map of the United States you can see the outline of a colossal tree straddling the center of the continent with its outermost twigs in the Appalachian and Rocky Mountains attached to its largest limbs, the Ohio and Missouri Rivers. Countless are the twigs and branches of this magnificent water-collecting system. Its trickles, brooks and creeks, in perfect sequence, increase steadily in size as they lead into the central trunk of the Mississippi River.

A watershed and a tree have similar silhouettes because they are both created by fluids moving under the influence of gravity. But here the similarity ends. Watershed patterns are two dimensional and their lines have capricious bends because they are etched on the surface of uneven ground. Tree patterns are three-dimensional and tend to be symmetrical because they are traced in the air by radiations of light.

Each day the radiant energy of the sun first strikes a tree from the east, then floods it from a constantly higher angle as the sun travels up and over the crown of the tree. Then descending, it paints the opposite side of the tree with sunlight, until the light is suddenly shut off at the western horizon. A tree is molded in the open air by the curving touch of light.

The diagrams of watersheds and trees are different in an even more arresting way. In a river system, water flows according to the pull of gravity; the sap in a tree flows in exactly the opposite direction, against gravity.

Thus, a tree can be imagined to be an upside-down river system. Its source is in the ground where root hairs and rootlets are the trickles, brooks and rivers. The water collected in the black earth flows through channels of increasing size and converges into the main stream at the base of the trunk. Then instantly, emerging from the ground, a column of water is formed that flows silently straight up into the air. The canopy of the tree then becomes the mouth of this upside-down river, where its water is released into the atmosphere as invisible vapor.

This is not a matter of a little moisture slowly creeping up through wood. A large tree transports water by the ton. Logs are heavy. A short section of a single Douglas fir log must be hauled in a 10-ton truck. It takes muscle even to heave split logs onto a campfire. About half of the weight of a fresh log is water, and the percentage is much greater in other parts of the tree; fruit-like

Rutherford Platt

This pitch pine *(Pinus rigida)* has survived wind and weather for more than a century at the highest point of land in Connecticut.

apples and cherries are 85 per cent water. Leaves and twigs on trees during the growing season are 80 per cent water. Singly, these items seem light, but a squat apple tree may have 100 thousand leaves, and a towering elm 6 million. The river of a tree has a wide and generous mouth through which, on the little apple tree, four gallons of water are expelled every hour. At this rate, an acre of apple orchard, planted with the usual forty trees, will collect from the ground and discharge into the air 480 tons of water a month. . . .

Ninety-nine per cent of the water which streams upward in a tree trunk is thrown away into the air from the top of the tree—a mere one per cent is used in the tree's living cells. This one per cent is enough to provide the hydrogen needed for the manufacture of carbohydrates by the leaves, for the protoplasm of cells, and for blowing up cells which are about to divide or elongate. But why only one per cent? . . .

About forty different elements are used to build and activate a tree, including

(Concluded on page 57)

MEETING THE SHADE PROBLEM

Selected plant material will turn shaded areas into landscape assets

Lowell Kammerer

Condensed from, *The Morton Arboretum Quarterly*, Summer 1965, Lisle, Illinois

EVERYONE who gardens is at one time or another confronted with the problem of planting in shade. If one can face such a situation objectively, the results have a much better chance of being successful. For, more often than is generally realized, shade is a landscape asset rather than the liability it is so often thought to be.

Lest one question the advantages of shade it might be well to mention a few known benefits. Nature is the best demonstrator of the potentialities of shade plants, one having only to walk through a woodland in the heat of summer to observe how inviting, restful, and refreshingly cool shade groupings can be. The pattern of sunlight and shadow on the forest floor is partially responsible for the pleasing effect, although the variations in texture, form, and color of the woody and herbaceous plants making up the undercover are equally significant. Only floral color is lacking, for it is the one feature which must be sacrificed in shade, in favor of the more subtle effects of foliage. Along the edge of a woods or bordering a roadside fence, shade is again a factor, although not to the extent it was in the woodland itself. Here, where more sunlight prevails, there are greater opportunities for blossoming shrubs and wild flowers, especially those preferring shade during only part of the day.

Nature has no monopoly on effective shade compositions, however. Man-made plantings, carefully done, are capable of results equally attractive and quite as satisfying. Foundation plantings on the north sides of buildings need not be regarded as troublesome if one knows what to plant. Likewise, there need be no undue concern as to what will grow on a shaded wall, under a roof overhang, or in the shadow of a densely foliaged tree, if one is familiar with the shade tolerances of various plants.

As with any other planting, success in shade depends upon several basic prerequisites, of which good soil is one of the most important. Essential in every form of gardening, it becomes doubly important in shade, where vigorous growth must be maintained. Fertilizer, preferably organic, is therefore necessary occasionally to help maintain a balanced growing medium. Adequate moisture is also indispensable, and during periods of scanty rainfall provisions must be made for artificial irrigation. Good air circulation, protection from unfavorable wind currents, and the ability to meet root competition are other factors to be considered.

Shade being a most elusive term, the complexities of its meaning will in all likelihood not be realized until one comes face to face with an actual shade problem. This will result in the discovery that there are various types and degrees of shade, each with well defined limitations as regards plant growth and adaptability.

Degrees of Shade

For practical purposes shade may be classified into four broad categories:

Full shade (FS in the list below)—The almost total shade prevailing under coniferous evergreens or low-branched, densly foliage trees such as American beech, a habitat tolerated by very few plants. The total shade of tall buildings in cities is even more difficult, not so much on account of the lack of sunlight, but rather because of such factors as pollution of the

Japanese pieris (*P. japonica*) is a broad-leaved evergreen that flowers in half shade.

air by poisonous gases, harmful air currents, and poor soil.

Deep shade (DS)—The shade of dense, deciduous woodlands where little sunlight penetrates after the expansion of the overhead foliage canopy in spring.

Half shade (HS)—A condition in which a given area is subjected to almost equal periods of sun and shadow. Examples, a woodland margin, woodland openings, or the half shaded sides of hedges, high walls or buildings.

Light shade (LS)—The shade of high branched trees, through which filtered sunlight reaches the ground beneath. This degree of shade supports a greater variety of vegetation than any other.

Deciduous Trees for Shade

Acer ginnala, Amur maple—LS
Acer rubrum, Red maple—LS
Acer saccharum, Sugar maple—L–HS
Amelanchier laevis, Alleghany shadblow—HS
Carpinus caroliniana virginiana, American hornbeam or blue beech—H–DS
Cercidiphyllum japonicum, Katsura tree—LS
Cercis canadensis, Redbud—L–HS
Cornus alternifolia, Pagoda dogwood—LS
Cornus florida, Flowering dogwood—L–HS
Crataegus succulenta (*C. macracantha*), Thicket hawthorn—LS
Halesia carolina, Silverbell—L–HS
Magnolia virginiana (*M. glauca*), Sweetbay magnolia
Malus ioensis, Iowa crab
Ostraya virginiana, Ironwood, hop-hornbeam—H–DS
Prunus serotina, Black cherry—HS
Larix decidua, European larch—LS
Thuja occidentalis, Eastern arborvitae—LS; moist soil
Tsuga canadensis, Eastern hemlock—L–HS; wind protection essential

Shrubs for Shade

Aesculus parviflora, Bottlebrush buckeye—LS; moist soil
Aronia melanocarpa elata, Glossy black chokecherry—LS
Caragana arborescens, Siberian peashrub—LS; tolerates dry soil
Ceanothus americanus, New-Jersey-tea—LS; tolerates dry soil
Chionanthus virginicus, Fringe-tree—L–HS
Cornus alba sibirica, Siberian dogwood—LS; moist soil
Cornus mas, Cornelian-cherry—LS
Cornus racemosa (*C. paniculata*), Gray dogwood—LS
Corylus americana, Hazelnut—L–HS
Diervilla lonicera, Dwarf bush-honeysuckle—LS; tolerates dry soil
Dirca palustris, Leatherwood—DS
Euonymus alata, Winged euonymus—L–HS
Euonymus alata compacta, Dwarf winged euonymus—L–HS
Euonymus europaea, Euonymus—LS
Forsythia ovata robusta, Forsythia—LS
Forsythia suspensa, Forsythia—LS
Hamamelis vernalis, Vernal witch-hazel—LS
Hydrangea quercifolia, Oakleaf hydrangea—L–HS
Ilex verticillata, Winterberry—LS
Kerria japonica, Japanese kerria—LS
Ligustrum obtusifolium regelianum, Regel's border privet—LS
Lonicera fragrantissima, Winter honeysuckle HS; branches subject to die-back during severe winters
Lonicera maackii podocarpa, Late honeysuckle—LS
Philadelphus coronarius, Mock-orange—HS
Physocarpus monogynus, Mountain ninebark—HS
Rhamnus cathartica, Common buckthorn—HS
Rhamnus frangula, Glossy buckthorn—HS
Rhodotypos scandens, Black jetbead—DS
Rhus aromatica, Fragrant sumac—HS
Ribes alpinum, Alpine currant—DS

Viburnum acerifolium, Mapleleaf viburnum —D–HS; prefers sandy acid soil
Viburnum burkwoodi, Burkwood viburnum —HS
Viburnum dentatum, Arrowwood—HS
Viburnum lantana, Wayfaring-tree—LS
Viburnum opulus compactum, Dwarf European cranberry-bush—LS
Viburnum prunifolium, Blackhaw—HS
Viburnum sieboldi, Siebold viburnum—LS
Viburnum trilobum, American cranberry-bush—HS

Broad-leaf Evergreens for Shade

*Useful as a vine or ground cover

Buxus microphylla koreana and cultivar 'Wintergreen', Korean littleleaf boxwood —HS
Euonymus fortunei 'Carrierei', Glossy wintercreeper—DS
Euonymus fortunei 'Colorata', Purpleleaf wintercreeper*—DS
Euonymus fortunei 'Vegeta', Bigleaf wintercreeper*—HS
Hedera helix 'Baltica', Baltic ivy*—D–FS
Hedera helix 'Bulgarian', Bulgarian ivy*—DS
Hedera helix 'Thorndale Sub-Zero', Thorndale sub-zero ivy*—DS
Ilex opaca, American holly—HS
Leucothoë fontanesiana (*L. catesbaei*), Drooping leucothoë—DS; acid soil
Mahonia aquifolia, Oregon holly-grape—HS
Mahonia repens, Creeping mahonia—HS
Pachistima canbyi, Canby pachistima—DS
Pieris japonica, Japanese pieris—HS; acid soil

Needle-leaf Conifers (shrubby) for Shade

Taxus cuspidata and cultivars, Japanese yew —D–FS
Taxus media and cultivars, Yew—DS

Vines for Shade

(See also Broad-leaf Evergreens)
Akebia quinata, Five-leaf akebia—HS
Ampelopsis brevipedunculata, Porcelain ampelopsis—HS
Aristolochia durior, Dutchman's-pipe—HS
Celastrus orbiculata, Oriental bittersweet—HS
Celastrus scandens, American bittersweet—HS
Clematis paniculata (*C. dioscoreifolia*), Sweet autumn clematis—LS
Hydrangea anomala petiolaris, Climbing hydrangea—LS
Lonicera henryi, Henry honeysuckle—HS
Parthenocissus quinquefolia, Virginia-creeper—DS
Parthenocissus tricuspidata, Boston-ivy—HS
Vitis riparia, Riverbank grape—DS

Ground Covers for Shade

(See also Broad-leaf Evergreens)
E=foliage evergreen S=Spring effect only
Adiantum pedatum, Maidenhair fern—DS; moist soil
Aegopodium podograria variegatum, Silver-edge goutweed—DS
Ajuga reptans, Carpet-bugle—HS
Ajuga reptans 'Bronzeleaf'—LS
Aquilegia canadensis, Wild columbine—DS
Asarum canadense, Wild ginger—DS
Asarum europaeum, European ginger—DS
Asperula odorata, Sweet woodruff—HS
Athyrium filix-femina, Lady fern—D–FS
Convallaria majalis, Lily-of-the-valley—HS
Dryopteris marginalis, Leatherleaf wood fern—E-DS
Dryopteris spinulosa, Toothed wood fern—DS
Epimedium macranthum niveum, Snowy epimedium—HS
Epimedium sulphureum, Yellow epimedium —HS
Euonymus fortunei 'Kewensis', Kew wintercreeper—E—HS
Euonymus fortunei radicans, Common wintercreeper—E—HS
Euonymus obovatus, Running euonymus—DS
Helleborus niger, Christmas-rose—LS
Hepatica acutiloba, Hepatica—E
Hosta species, Plantain-lily—HS
Lamium maculatum and var. *album*, Dead-nettle—HS
Liriope spicata, Lily-turf—E-HS
Mertensia virginica, Bluebell—S—DS; moist soil
Osmunda cinnamomea, Cinnamon fern—DS; moist soil
Pachysandra procumbens, Alleghany pachysandra—DS
Pachysandra terminalis, Japanese-spurge—E—D–FS
Podophyllum peltatum, May-apple—L–HS
Polemonium reptans, Jacob's ladder, Greek-valerian—LS
Polygonatum species, Solomon's-seal—DS
Polystichum acrostichoides, Christmas fern —DS
Pteretis pensylvanica (*P. nodulosa*), Ostrich fern—DS
Pteridium aquilinum, Bracken—HS
Pyrola elliptica, Shinleaf—D–FS
Sanguinaria canadensis, Bloodroot—S—DS
Smilacina racemosa, False spikenard—DS
Stylophorum diphyllum, Celandine-poppy—DS
Thalictrum dioicum, Early meadow-rue—LS
Tiarella cordifolia, Foamflower—DS
Uvularia grandiflora, Bellwort—DS
Vinca minor and varieties, Periwinkle, running-myrtle—E—DS
Viola papilionacea priceana, Confederate violet—HS
Viola striata, Striped violet—HS

AFTER DARK

Stanley Schuler

Condensed from *Home Garden*, May 1965

WITH just one beautiful or interesting and well-placed tree, a dark garden can be turned into a night-time delight. No garden feature looks better under electric light than a tree. None creates such a large effect at reasonable cost (roughly $25 covers the cost of the wire and fixtures needed to light a tree).

The best way to go about lighting a tree is simply to experiment with different lights in different positions until you create a picture you like. Results will come fast if the following points are borne in mind.

1. Trees with open structure and lacy foilage are far more effectively lighted than those with dense foliage.

2. To bring out texture and create an interplay of light and shadow, angle the light toward the tree.

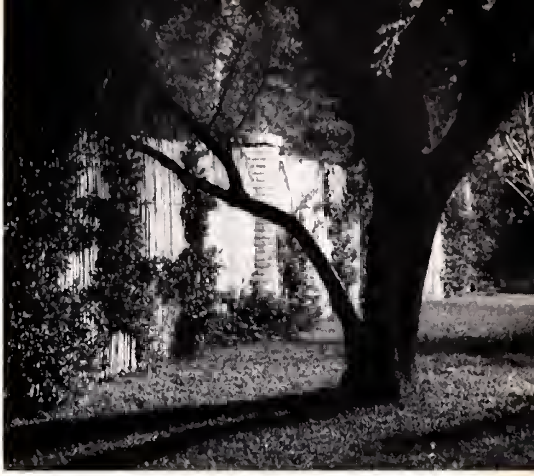
3. Two or more lights do a more satisfying job than one. They should be aimed at different angles; and the intensity should be greater on one side of the tree than on the other.

4. If a tree has a handsome canopy, as an elm does, aim light up into the foliage from below. The fixtures can be sunk in the ground, hidden amongst flowers or shrubs, or mounted on the tree above eye-level.

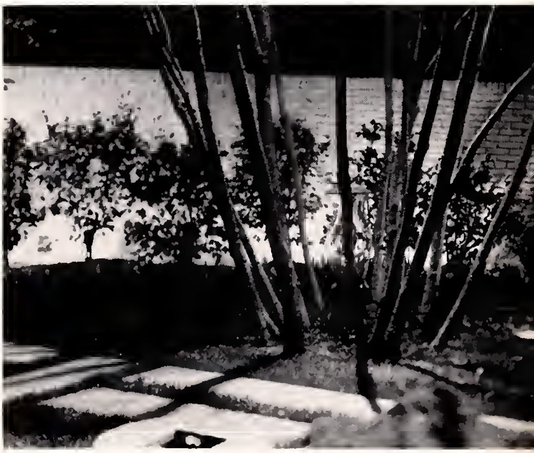
5. If a tree has out-reaching branches that move in the breeze, place lights high in the tree and aim down so that the shadows of the branches wander across the ground.

6. If a tree has an interesting branch or trunk structure fairly close to the ground, aim lights from the ground or the side at the point of interest.

7. If a small tree has a very open, attractive structure, make it stand out in silhouette by placing a light behind it on the ground and aiming up and slightly away from the spreading branches. A weak light should also be directed at the front of the tree so that it is not jet black.



Floodlighted fence silhouettes tree-trunks in foreground; lesser illumination thrown against trees prevents blackness. Tree beyond wall at far right is lighted from ground.



Double lighting is used on this clump of birches: Light from ground is aimed upward; additional lights, mounted in branches, shine downward. Floodlighting of brick wall silhouettes shrubbery. *Lighting and photographs by John Watson.*

8. To dramatize the shape of a tall, columnar tree, such as a Lombardy poplar, place three or four lights on the ground around it and aim up.

9. To accent heavily textured bark, graze lights of different intensity across it from two directions.

10. Remember that lighted deciduous trees are often as fascinating in winter as in summer. But in lighting a tree for winter effect, take extra pains to hide the bulbs from direct view.

GREEN SPACES AS LIVING MEMORIALS

Mrs. Neill Phillips and Mrs. Avery Rockefeller

Condensed from the *Bulletin* of the Garden Club of America, January 1965

"TIME eats away the massive monuments of stone that we set up to honor those we have cherished, for stone cannot renew itself," said Dr. Paul Sears at the dedication of the Jane B. Francke Bird Sanctuary in 1954. "Only living things can, for life begets life . . . So it is an occasion to rejoice when a spot is dedicated to the preservation of living things."

Forty-five years ago, when few men were conservationists and even fewer women, Jane B. Francke, a member of the North Country Garden Club of Long Island, staged at the New York State Fair at Mineola what was probably the first conservation exhibit in this country.

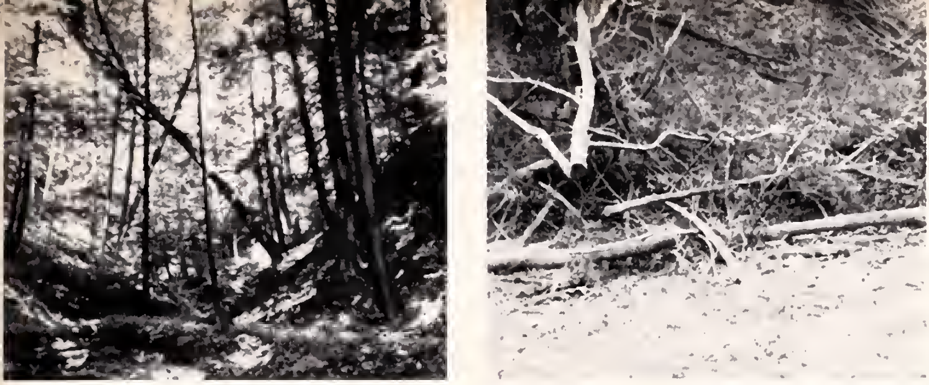
Through the succeeding years, Mrs. Francke continued her educational work, set up traveling nature libraries, and in 1953 was given the Garden Club of America's highest Conservation Award, the Frances K. Hutchinson Medal. The following year, a group of devoted friends and her daughter and son-in-law, Mr. and Mrs. John M. Whitaker, inspired by Mrs. Montgomery Hare's idea of "Save a Green Acre," created at Brookville, Long Island, one of the most delightful woodland sanctuaries we know, as a memorial.

This area is less than an hour's drive from New York and contains only 3.8 acres, yet it comprises the natural beauty of a wilderness. Here at all times of the year you may see and hear birds. Everywhere the plant material is labeled; at intervals along the fence are framed pictures illustrating the habits of a small animal, so a child may know, for example, what a squirrel eats besides peanuts, and where he lives. The 21 varieties of trees and shrubs, chosen for food and shelter, are described in a four-page leaflet given to visitors.

The stream flowing through the wooded ravine looks like a mountain brook, but this is a clever ruse. Because of encroachment of highways, the original stream dried up, but Mrs. Whitaker and Mrs. Daniel Bacon worked out a water system which is turned on and off by members of the North Country Garden Club, which maintains and sponsors the Sanctuary.

The 30-foot waterfall is probably unique: it was originally part of the Shenandoah National Park exhibit staged last March by the Garden Club of America National Parks Committee. The Sanctuary Committee of the North Country Garden Club bought the exhibit complete —boulders weighing from 500 to 1000 pounds, redbud tree, azaleas, ferns, wild flowers—placed everything in the Sanctuary ravine as exactly as possible as in its own habitat. Today it looks as if it had always been there. The small mountain stream flows slowly between lichened rocks and wild flowers; the splashing from the wings of birds as they bathe in the three small pools keep the wild flowers moist all summer.

The Sanctuary is open all year from sun-up to sun-down, and no more than 15 children may visit it at one time. Their absorbed faces recall the words with which Mrs. Francke accepted the Francis K. Hutchinson Medal: "Conservation should start at home with the youngest children. Conservation is a way of life. If children grow up where they have a daily example of wise use, whether it be of mended stockings or composted leaves, they will never be wasters. If, at the family dinner table, the sunset is admired or the early arrival of the robins or song sparrows noted, or a discussion is heard of the songs of the wood thrush versus hermit thrush, that child will grow up feeling himself a part of this living, wonderful universe."



The unspoiled glen *(left)* is a secluded spot of rare woodland beauty. When a sawmill moves into a glen *(right)*, native beauty is lost—often for all time, and little valuable lumber is obtained.

A PLEA FOR THE SMALL GLENS

L. H. MacDaniels

Condensed from *The Cornell Plantations*, Autumn 1965

THE Finger Lakes are geologically unique in the United States. Thousands of years ago the glaciers gouged out the parallel river valleys, leaving parallel lakes with depths below sea level.

The smaller streams were left as so-called "hanging valleys" with their outlets far below their original position. Since glaciation, these streams have cut the gorges and ravines which are an outstanding attraction to the area.

Concern at the present time should be for the scores of smaller glens that line both sides of Cayuga Lake and the inlet valley. Where these glens are unspoiled, they are outstanding for their secluded woodland beauty. Towering hemlocks find footholds on the crags and steep slopes along with tulip, magnolia, hickory and dogwood trees. Wild flowers and ferns are abundant, and each glen may be the sanctuary of a wood thrush or veery or the great pileated woodpecker.

Until fairly recently these glens have been secure from devastation because of the difficulties of lumbering. With only a horse and two-man saw, the trees were difficult to get.

Now with the bulldozer, the chain saw, the high powered winch and the portable sawmill, all is changed. The devastation wrought by this mechanized power is unbelievable. The glens are left a shambles of twisted and broken tree tops, raw earth churned up by the bulldozers and tractors and the stream bed choked by the debris of the logging operation.

The use of these ravines for dumps is a practice of long standing. The debris is carried downstream so that the entire glen is strewn with all manner of refuse.

Federal conservation agencies, and private organizations, such as Nature Conservancy, have concern for matters of this kind and have funds that can be used for certain conservation practices that might apply to the glens. However, to take any effective action it is necessary for local groups to take the initiative. It appears, therefore, that about the only effective immediate action is for the interested individuals to secure control of the glens with the purpose of conserving their beauty.

The difficulty is that time is running out. The logged-over ravines are despoiled so that it will take a half-century to recover their former charm, and logging operations are already planned for others. It is hoped that individuals, cottage associations and other agencies concerned will take some effective action to halt the destruction of the glens before it is too late.

A ready-made landscape can be the home-owner's reward when he chooses a site with trees and keeps the best of them.

SAVING TREES ON HOME SITES

Jack Rebhan

Condensed from *Home Garden*, January 1965

IF you are building a new home or have just purchased one, and are about to plan the plantings around it, restrain the axe and bulldozer and consider this idea: Existing growth—trees, shrubs—can be invaluable if pointed up imaginatively, and will provide a unique setting for the new house as well as soften some of its raw, too-fresh look. These existing trees and shrubs give an immediate effect and, being naturally adapted to your site, require little care. So-called difficult areas, like a sandy ridge, a marsh, a woodland section, can be made the *pièce de resistance* of a home landscape.

Obviously, not all the existing growth can be preserved when a house is built. A clearing must be made for the house, re-contouring may be necessary to insure proper drainage, and some growth must be removed for driveways, paths, terraces and garden areas. But except for these essentials, it is pointless to clear land then replant at great expense.

Landscaping with existing plants and plantings is practical. The reward is great in aesthetic terms, as well as financial ones.

TREE-SAVING BOOKLET

As a guide for home-owners who wish to save the best of the trees on their property when the house is being built, the United State Department of Agriculture has recently issued an illustrated 8-page booklet. Under the title "Protecting Shade Trees During Home Construction," it deals mainly with evaluation of trees that might be saved and with protection of trunks and roots from damage during excavation, changing of grade, building and cleanup. Listed as Home and Garden Bulletin No. 104, it is available for five cents from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.

A TREE IS FOREVER

Barbara Black

Reprinted from *Popular Gardening & Living Outdoors,* March 1965

THERE'S a sense of security in a tree. Once it sets its roots, you know it plans to stay right there for a good long time. That's why a good tree is a practical investment. The older it gets, the more it and the property it shelters are worth in cash, comfort, and charm.

But an unwisely selected or carelessly planted tree can become a monumental headache. Your windows may be blocked, your waterpipes burst, your neighbors alienated by encroaching limbs or roots, your family menaced by an overgrown driveway, and your sleep ruined by banging branches on a wild winter night—all from planting the wrong tree in the wrong place.

So before you buy a tree find out what it's going to become in another ten or even twenty years. Find out how tall it will grow, and how fast. Learn its spread at maturity—and whether this is low down, as with spruce, or high overhead, as with an oak. Is it deep- or shallow-rooted? A whole garden can be grown under a deep-rooted tree, but shallow roots choke out all other plants.

How to Choose an Evergreen Tree

Beware of sharply pruned evergreens like rounds, cones, and other monstrosities. They require constant attention to keep them in shape, and they will always get worse, never better. Instead, look for naturalness when selecting your evergreens.

Four general locations where evergreens may be used most effectively are: around the house, on the lawn as specimen plantings, in a background or bor-

der, and on rocky slopes or other interesting terrain. Each location calls for a particular sort of tree, and this must be a prime consideration in your choice. Decide where you want a tree, then decide what sort of tree is best.

Basic house plantings. Under windows, plant true dwarfs like *Taxus baccata repandens* (hardiest of the English yews), dwarf juniper, or dwarf *Ilex crenata* (Japanese holly). For house corners where more height is needed, use trees that can be controlled by pruning. Some cannot be pruned or topped.

Specimen lawn trees. These should be trim, well-shaped, and decorative. Many firs, spruce, and yews will grow into magnificent specimen trees if you select the variety with care and give it room.

Background or border evergreens. If you have room, a combination of fast-growing pines, hemlocks, and slower-growing evergreens can produce a striking effect. If space is a problem, try slow-growing compact kinds.

Rocky ground or slopes. Dwarf trees, and unusual types like Mugo pine, offer a wide selection for dressing up difficult terrain.

Choosing a Deciduous Tree

Deciduous trees for the home grounds are of two general types: large shade trees beneath which you will be able to walk when the tree is mature, and smaller decorative trees to plant singly in the lawn or border.

For a shade tree, choose a well-branched specimen with a straight trunk —an oak, maple, beech, moraine locust, or mountain-ash. Climatic tolerances vary considerably, even between varieties of the same species, so seek out trees that are hardy in your area.

Decorative trees, like dogwood, crab-apple, magnolia, birch, Japanese maple, cherry, or the dwarf fruit trees can enhance your grounds with interesting silhouettes, attractive flowers, interesting foliage, fragrance, and fruits or berries —all within a reasonable amount of space. But choose carefully among varieties, or your tree may surprise you. All crab apples, for instance, have lovely blossoms—but some are laden with beautiful autumn "berries" while others litter the lawn with ugly little apples.

Planting A Tree

Most evergreens and many deciduous trees will come balled and burlapped (the roots encased in a good ball of earth, wrapped in burlap, and tied securely), and this is the safest way to buy them. Before planting, keep the rootball moist but not sodden. Protect the tree from sun and wind. Sprinkle evergreen foliage frequently with water or spray with a protective coating.

Bare-root planting is basically the same as for balled-and-burlapped trees, with these additions: (1) When tree arrives, sink roots in muddied water or wrap in wet burlap—never let them dry out or expose them to sun. (2) Trim off overlong, broken, or straggly roots—never wind or knot them. (3) When you set the tree in the hole, hand-pack the soil firmly around, under, and between the bare roots.

With careful planting, a new tree has a better chance of being a joy "forever."

Louis Buhle

A disadvantage of some crab apples is their habit of dropping fruit on grass, sidewalk and roadway. Solution: Select varieties that hold their fruit through winter or that bear fruit relished by migrating birds.

WHY, MR. NURSERYMAN?

Valleau C. Curtis

LET us suppose you have read an article in your favorite garden magazine concerned with the recommendation of plants for a typical shrub garden. For an unusually fine slow-growing major tree the sour-gum (*Nyssa sylvatica*) is suggested—a tree of distinct character and beautiful fall color; the Yulan magnolia (*Magnolia conspicua*) is listed as one of the finest of the ornamental flowering trees; and for a broad-leaved small evergreen shrub the rhododendron hybrid 'Windbeam' is considered an excellent choice.

Your garden is of the type that makes all suggestions strike a sympathetic note. And so you drive to your favorite local nurseryman with these suggestions. He informs you after a considerable search that he does not grow them; neither can he be sure of securing them from his wholesale sources.

You are upset and feel that the nurseryman has let you down. But before taking too strong an attitude toward the nurseryman, please consider the whole story and try to understand the complexity of the nursery business.

In the first place, the garden magazine writer should be applauded, not criticized. The choice of trees and shrubs is excellent. The only problem is that they happen to be three plants that, in the first place, have not proved to be popular enough with the buying public to grow in quantity; and, in the second place, in propagating and growing, they each present technical problems that make them unprofitable to produce.

Your favorite nurseryman may be knowledgeable and competent, yet he cannot begin to supply you with all of the most desirable plants for your garden.

Because of the complexity of the business of growing plants, the nursery industry has become in a large measure a business of specialists. Each specialist and each type of nursery, to survive, ha shad to gear the particular business to produce items that can be grown best. If it spreads into areas that are unprofitable it must be done with full knowledge of the financial problems involved. A nursery must realize a profit on its operations if it is to stay in business.

Sour-gum *(Nyssa sylvatica),* a picturesque tree that is difficult for a nurseryman to transplant *(see text).*

Many people have the idea that all a nurseryman must do is to sow the seed or plant the seedling and sit back and wait for it to develop into the product that will in turn be sold for a handsome profit. Nothing is farther from the truth. Here are some of the questions that he must consider:

1. What shall I grow that will be in demand 5 to 10 years hence when the small seedling or cutting becomes of marketable size?

2. How shall I plan my land use for the next 10 years so that the permanent crops will live under the best cultural conditions?

3. What machinery will I need to assure the best and most efficient results from cultivation, root pruning and transplanting?

4. How shall I plan my irrigation system? (With the present frequency of drought years, this factor becomes an essential part of nursery operation.)

5. Do I have enough profit from my overall business to justify the planting of specialty items that need special care and have a limited market?

6. Shall I consider planting a larger, more mature and more expensive tree or shrub to grow for a more immediate market, rather than small liners?

These are only a few of the many problems that beset the nurserymen. One reason is that the major portion of the most desirable trees and shrubs used in gardens take from 5 to 10 years to develop to landscape size.

To try to simplify the nursery establishment I shall endeavor to classify in general the following types of nurseries:

1. The *large wholesale nursery* which grows principally the fast-growing items most commonly found in the retail market, such as fast-growing shade trees and flowering shrubs. These are the basic items of the suppliers for the larger dealers, multiple store trade, mail order houses, etc. These nurseries are located in warm or temperate climates that are particularly well adapted to the growing of plants.

2. The *large wholesale nursery* which grows a large and as nearly as possible a complete line of trees, shrubs and groundcover plants. It sells to all classes of dealers and particularly to landscape contractors.

3. The *wholesale propagating nursery*, which propagates plants by means of seed and cuttings and sells its wares to the wholesale grower as well as to the small nurserymen who may have only a few acres.

4. The *wholesale grower* who specializes only in large trees (major and minor) for sale to the landscape contractor.

5. The *wholesale nursery* which specializes in growing large quantities of items such as azaleas, rhododendrons and hollies for all types of dealers and landscape contractors.

6. The *small specialty nursery*, which grows unusual and dwarf types of plants for the retail trade.

7. The combination of a *small nursery* (5 to 10 acres) and *landscape contractor*, who grows only a limited number of items, but who also plants and services them for the customer. This classification, in which one is most apt to find his favorite nurseryman, embraces organizations that hire from 10 to 100 men, and that are equally capable of doing a small residence job or following a landscape architect's plan for an industrial building.

8. The *garden center* type nursery, which buys all of its plants and sells strictly on a retail cash-and-carry basis.

9. The *mail order catalogue*, which has no growing nursery, but possesses the imagination and skills to present to the prospective buyer the plants which in turn are purchased from the wholesaler.

In general, this covers the nursery establishments, though I have limited my analysis to the tree, shrub and groundcover people and have omitted other phases of the nursery field such as growers of perennials, annuals, seed and sod.

So when a customer asks for *Nyssa sylvatica,* one of the most desirable of slow-growing trees, he should realize that there are few of this species grown in the wholesale market because they are most difficult to propagate and their weak root systems make several transplantings necessary. Only the specialist can afford to grow them, and he must sell only retail.

And when *Magnolia conspicua* is requested, it should be remembered that this magnolia is not often used in the general landscape market. It is difficult to get started and presents technical cultural problems. These, too, are only grown by the small specialty nursery.

The rhododendron 'Windbeam' is a delightful small form of rhododendron—hard to grow profitably but if one persists it may also be found in the small specialty nursery.

So when you read of some unusual plants in your favorite garden magazine, remember not to expect to find them at your neighborhood nursery, any more than you would expect to find diamonds in a supermarket.

MOVING PLANTS BETWEEN STATES

Barbara Black

Condensed from *Horticulture*, October 1965

To protect farms, gardens and forests across the land from the inroads of new pests and diseases, Federal laws have been in effect since 1912, and since that year of awakening every state has imposed its own restrictions on the movement of plants.

"All plant controls are aimed at three objectives," in the words of A. E. Peters, Inspector in Charge of the Plant Quarantine Division of the U.S.D.A. in New York City. "(1) To keep plant pests out of the country; (2) to eradicate them if they get in, and (3) to contain them in the smallest possible area."

State laws help the Federal Government to carry out these aims.

IF even a single plant is to be carried from one state to another, it is important to find out what regulations may affect its passage. Also subject to interstate quarantine laws are the alternate hosts of diseases, symptomless carriers, and infected packing materials, containers and soil. These regulations can be obtained from the County Agent of the U.S.D.A., at the county seat, or from the Plant Quarantine Division of the U.S.D.A. at the capital of the state of destination.

When the state-of-destination rules arrive, here are some points to watch for:

(1) Does it have regulations concerning containers and packing materials? Some grain states (fighting the alfalfa weevil and khapra beetle) restrict hay and straw packing. (2) Is soil permitted on plants or in pots? Must it be sterilized? (3) Are gifts of fresh fruit, cut flowers or evergreens permitted? (4) Do you need an inspection certificate before shipment? Is reinspection upon arrival required? (5) Must the plant be fumigated before shipment? Your local quarantine inspector will inspect your plants, give you free advice and all necessary certificates for interstate shipment without charge. But you must pay a small fee for professional fumigation when it is required.

Here, briefly, are the things you should do before you even dig up your plants:

1. Start with your county agent. Or write directly to the Plant Quarantine Division at the state capital involved. Obey rules in pamphlets sent to you.

2. Arrange for inspection, certification and fumigation, if necessary.

3. Label fully and correctly: where the plant was grown, its correct name and description, your name and address and the plant's destination.

4. Observe rules for packing, containers, methods of shipment. Your local florist can advise you on potted plants and small items, your nurseryman on large plants.

For shipping of plants by amateurs, the following methods are recommended: (1) Railway Express, which is experienced, helpful and has pick-up and delivery. (2) U. S. Postal Service. Your postoffice will advise you on how to do this. (3) Air shipment. This eliminates the likelihood of plants drying out through long transit. Certification is usually necessary for interstate movement, however. (4) Transportation in your own car, with proper labeling and certificates correctly filled in.

When shipping by moving van with household goods, the driver *may* carry small plants as a personal favor. But the moving company can assume no liability for condition or safety.

Gottscho-Schleisner

Traditional Japanese garden, most photographed section of Brooklyn Botanic Garden.

THE BROOKLYN BOTANIC GARDEN

"Many gardens within a garden"

Richard C. Hands

Reprinted from *Horticulture*, October 1965

"MANY gardens within a garden" was part of the philosophy of the founders of the Brooklyn Botanic Garden, and a visitor to the Garden today quickly sees how well this idea has been carried out. Every type of garden is represented, from a Wild Garden filled with lush vegetation, to a Stone Garden without a tree or shrub. A walk through the Garden is, therefore, not merely a pleasurable experience; it is an introduction to all phases of the gardening art.

Last June, Dr. George S. Avery, the Director, kindly showed me around the Garden. Although spring features such as magnolias, cherries and lilacs were through blooming, other plants were at their peak. Lindens were in bloom near the Osborne Memorial Garden, swamp azalea or "honeysuckle" scented the Wild Garden, butterflyweed and lavender were out in the Herb Garden and, of course, the Cranford Rose Garden was bright with color. Although a short article can only mention briefly many of the Garden's major features and activities, it will, hopefully, encourage many readers to visit this institution and experience more fully the pleasures which can only be touched upon here.

First, we went around the annual, perennial and water gardens which are in front of the large greenhouse to the south of the Administration Building. Many old favorite plants were growing in these gardens: it was as pleasant to find coralbells, which I have known since a child, as it was to meet sunwheel, *Buphthalmum*, which I had never seen before. Hardy waterlilies were out. A second pool of tropical kinds was to be planted soon.

Passing the Garden of Fragrance for the Blind and its handsome gate decorated with a dianthus motif, we moved much farther along until, in the distance, I saw a massive white rambler rose covering part of the pavilion in the Cranford Rose Garden. This old rose, which proved to be Sander's White Rambler, was particularly refreshing to look at on that warm morning. All types of roses were there: 'John F. Kennedy', 'Mister Lincoln', 'Matterhorn' and 'Royal Highness', as well as damasks, gallicas and many species. The labeling is excellent throughout the Brooklyn Botanic Garden, and in the Rose Garden is especially valuable as a guide to the enormous collection, which is a flowering history of roses.

Next we went to the Wild Garden, made uniquely attractive by an oaken gate in which are placed cast designs of ladyslippers and other wildflowers. This garden, a two-acre tract which contains plants native within a 100-mile radius of New York City, is separated from the traffic on Flatbush Ave. by an embankment, part of Frederick Law Olmsted's original design for the area. Bog, woodland and sand barren gardens are found here, as well as many great trees, of which a fine sweet-gum is outstanding.

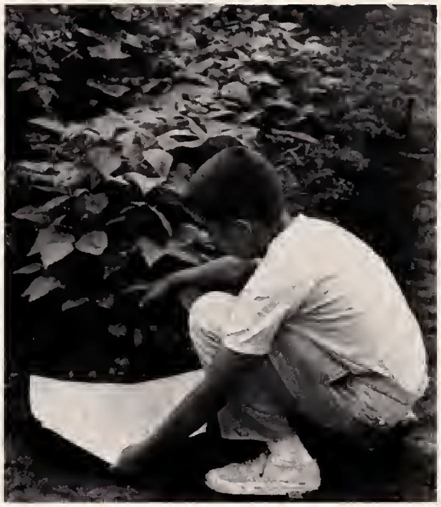
From this garden of wilderness we went to the garden of perfect order, the Japanese Garden. Inside the gate, to the right, Mr. Frank Okamura, in charge of this garden, was "cloud pruning" a Japanese holly. This term perfectly describes the shapes into which the shrub had been trained. "It must look right from all angles," explained Mr. Okamura. And so it did.

Dr. Avery said that the Japanese Garden is the most often photographed part of the Brooklyn Botanic Garden. Yet how little a photograph captures! None of my strongest memories of this garden

Gottscho-Schleisner

Trees, shrubs and herbaceous flowering plants that grew within 100 miles of New York City in the days of the American Indian are in the woodland (wild) garden. Here, a grass path leads into the woodland.

Louis Buhle



(Above, left): Indoor lessons, which include the potting of plants in the greenhouse, are part of the learn-by-doing courses offered for children. Similar courses are given for adults. *(Above, right):* Planting day—the start of the outdoor growing season for the children's classes. *(Left):* Later in the season, beans are ready for picking.

could be found in a picture: the sound of the waterfalls, the summer breeze ruffling the water, the feeling of the huge bole of a bald cypress as I drew my hand across it. You must sense these things for yourself.

So, too, the replica of Japan's famous Ryoanji Temple Stone Garden means most to those who bring the most to it. This garden, which we entered close to noon, was filled with light and silence; its precisely grouped stones recalled for me many sights of shore and hillside. Many visitors find the garden empty. It is. And, yet, it is full. Here, again, description or photography is of little value. You must go and you will either find something or you will not. But if you are disappointed, be disappointed in yourself, not Ryoanji.

Discipline, so important a part of Japanese gardens, appears too in the art of bonsai, for which the Brooklyn Botanic Garden is famous. Dr. Avery showed me the large collection of splendid bonsai in the greenhouse and shaded area adjacent. I share with him the opinion that among the finest specimens are those of the Japanese white pine, *Pinus parviflora*, for the short needles look quite right on the culturally dwarfed specimens.

Bonsai classes are among the most popular of all the adult education courses on popular horticulture, science and art, and the PLANTS & GARDENS *Handbook on Bonsai* is most in demand of all publications in that valuable series. This handbook, as well as such others as *Succulents, House Plants, Flowering Shrubs, Japanese Gardens, Flowering Trees, Propagation* and *Flower Arranging* is available for one dollar a copy from the Brooklyn Botanic Garden, 1000 Washington Ave., Brooklyn, N. Y. 11225.

The Children's Gardens, which we saw filled with beans and cabbages ready for picking and corn already tasselled out, are another phase of the Garden's educational program. Under the direction of Miss Frances M. Miner, Curator of Education and Deputy Director, the Children's Gardens continue to serve, as

Louis Buhle

This greenhouse exhibit shows part of a large collection of bonsai from Japan.

they have for over 50 years, as a guide for similar work throughout the country. Early spring classroom work is followed by cultivation of the vegetable gardens, beginning in April. I was a little embarrassed to see the children's vegetables so much farther along than my own in Massachusetts.

In the greenhouses (which contain large collections of tropical and other exotic plants), I noted an experiment in progress on the effect of air pollution on plants. Other research in this area, as well as studies of soil microbiology in general and nematodes in particular, are conducted at the Garden's 223-acre Field Station at Kitchawan, Westchester County, N.Y. An important part of the research and educational program at the Garden is the Library of 50,000 volumes and pamphlets, housed in the Administration Building at Brooklyn.

The Cranford Memorial Rose Garden attracts more than a million visitors each year.

Louis Buhle

THE ANCIENT CURSE OF RHODODENDRON HONEY

David G. Leach

WHEN Confederate soldiers tied sprigs of "honeysuckle" (wild azalea) to their rifles for parades, as a nostalgic reminder of the May campaigns in Virginia, the symbolism of the flowers was more apt than they knew. Rhododendrons and azaleas, both in the same genus of plants, contain one of the most deadly of the world's natural poisons. Its grim history coils back more than 2,400 years. In the ancient world the course of western civilization was affected by its lethal impact.

The first man in recorded pre-Christian history to be ensnared by the insidious rhododendron was the brilliant Xenophon—author, military leader, and intimate of Socrates. His *Anabasis* describes the retreat from Babylon of 10,000 Greek soldiers of fortune in 401 B.C., following the slaughter of their officers by the treacherous Persians. Trapped deep inside Asia Minor, surrounded by the enemy, the despairing Greeks elected Xenophon to command. Taking a supreme gamble, he led them inland to the mountains of Kurdistan. In deep snows and bitter cold the starving soldiers fought their way through savage mountain tribes into Georgia and then Armenia.

Two days' march from Trebizond (Trabzon) on the Black Sea coast of Turkey, the army came near to disaster. In Xenophon's own words, ". . . there being great quantities of beehives in those villages, all the soldiers who ate of the honeycombs lost their senses, and were seized with vomiting and purging, none of them being able to stand on their legs. Those who ate but a little were like men very drunk, and those who ate much, like madmen, and some like dying persons. In this condition great numbers lay on the ground, as if there had been a defeat, and the sorrow was general. The next day, none of them died, but recovered their senses about the same hour they were seized; and the third and fourth day they got up as if they had taken a strong potion."

At no time in the retreat had the soldiers been so vulnerable. One of the epics of military history nearly became an anticlimax of accident, instead of a stirring account of bravery, endurance and ingenuity.

Xenophon's anguish as he faced calamity with his soldiers unaccountably stricken after months of battle and privation was all because of a rhododendron. The honey had been made from the poisonous nectar of the yellow-flowered azalea, *Rhododendron luteum,* which gilds the hillsides in springtime near Trebizond to this day, and brings harrowing illness and death to unwary peasants.

The Drama Repeated

History is full of curious coincidences, and the Roman empire was later to falter momentarily because of the same rhododendron. In 67 B.C. Cicero had supported the transfer of army command from Lucullus to Pompey in perhaps the most skillful of his political speeches. And so Pompey, 37 years old, embarked on a campaign to conquer Rome's ancient and inveterate enemy, the King of Pontus, Mithridates, one of the most formidable intellects and most dramatic personalities of the ancient world.

The campaign began auspiciously. Pompey's military genius steadily eroded the armed strength of Mithridates until the following year, when a part of his troops camped near Trebizond, at almost exactly the same place where Xenophon's exhausted soldiers had stopped to forage for provisions 335 years earlier. The drama was repeated, but with an ending far different. After eating the poisonous honey the disabled troops were massacred by the Pontic army and it was to take Pompey three years to defeat Rome's wily enemy. So, to a degree, was the flow of power of the Roman empire dammed for a time by a rhododendron.

The reason for Pompey's military reverse filtered back to Rome and became a part of the lore surrounding the legendary general. A hundred years later the famous Roman naturalist, Pliny, was writing of the madness caused by this same rhododendron.

Dioscorides, the greatest pharmacologist of antiquity, whose *De materia medica* was the dominant herbal used by physicians for more than 1,500 years, wrote a half century after the birth of Christ, "About Heraclea Pontica, in certain seasons of the year, the honey makes those mad who eat of it; and this certainly proceeds from the quality of the flowers from which it is distill'd. They sweat abundantly, but they are eas'd by giving them rue, salt-meats and metheglin, in proportion as they vomit. This honey is very acid, and causes sneezing. It takes redness from the face, if pounded with costus. Mixed with salt or aloes, it disperses the black spots that remain after bruises."

In 1700 M. Tournefort, then the most eminent botanist in Europe, spent three years in Greece and Asia Minor collecting plants at the direction of Louis XIV. Eighteen years later his *A Voyage into the Levant* was published as a collection of letters addressed to the French Secretary of State. They were a vivid recital of his observations and a fascinating diary of the perils of his journey. In it he weighed the writings of the ancient Greeks and Romans on rhododendrons and added an anecdote of his own: "I thought it [*Rhododendron lutem*] so very fine that I made up great nosegays of it to put in the Bassa's tent; but I was told by the first officer of the household that this flower caus'd vapours and dizziness. I thought he rally'd very pleasantly, for the Bassa complain'd of those distempers. The first officer gave me to understand that he was in earnest, and assur'd me he had lately been inform'd by the natives that this flower was prejudicial to the brain. Those good people, from a very ancient tradition, grounded perhaps upon several observations, maintain also that the honey which the bees make after sucking that flower, stupifies those who eat of it, and causes loathings."

Don Richardson

Rhododendron luteum, an ornamental shrub native to the eastern Mediterranean area, where it has been a history-making source of virulent poison.

Medical Tragedy

Fifty years later in St. Petersburg of Imperial Russia, John George Gmelin, a German professor of chemistry and natural sciences, published *Flora Sibirica,* which was to bring down upon the Europeans a curse lasting nearly a century. He reported that a tea made from the leaves of a rhododendron was used successfully by foresters in Siberia to alleviate rheumatic knee pains, and as a restorative after laboring at high altitudes. He was referring to *Rhododendron chry-*

santhum, called the snow rose, a dwarf species with white or yellow flowers which grows in the eastern reaches of Asiatic Russia. J. G. Gmelin's book was published posthumously but his notebooks had been inherited by his nephew, Samuel Gottlieb Gmelin, who was also a professor and botanist at St. Petersburg. The nephew passed on to the chief health officer of Stettin in Germany, Dr. Alexander Bernard Koelpin, the information of medical interest which he had found in his uncle's papers.

On October 10, 1776 Dr. Koelpin began treating fifteen of his arthritic patients with tea prepared from dried rhododendron leaves which he had received from Siberia. With German thoroughness, he kept a daily diary. On October 27th, seventeen days after the treatment was started, one patient reported that his arthritic pain had disappeared and that he was comfortable except for tightness in his chest. The morning tea of rhododendron leaves was continued, but a few days later his pulse slowed alarmingly. He felt intoxicated and by the end of November he was near unconsciousness, with a halting, irregular pulse and excruciating pain beneath his breastbone. During December the patient's breathing became so slow that he was near suffocation and Dr. Koelpin prudently decided in early January, three months after it was begun, to stop the medication. The patient lived for nine months afterward, his arthritis somewhat improved.

Fourteen other patients were treated with much the same result. Two of them died, but the physician thought that the tea was not responsible. Dr. Koelpin felt that the treatment in his eleventh case was particularly successful in relieving the pain of arthritis and so he published, in 1779, his recommendations for the guidance of the medical profession, *The Use of the Snow Rose in Arthritis.*

No one knows how many hundreds, or thousands, or tens of thousands of suffering arthritics were subjected to the appalling rhododendron tea treatment as a result of the distribution of Dr. Koelpin's book to doctors throughout Europe. Rhododendron leaves were shortly included in the pharmacopeia at Edinburgh, Scotland. Certainly the therapy traveled quickly across the Atlantic because Professor B. S. Barton, in his *Collections*, a compendium of information on medically useful plants published in 1794, mentions ". . . the *Rhododendron chrysanthum,* which has lately acquired much reputation in the cure of chronic rheumatism."

Twentieth Century Research

In 1901 Dr. Konstantin Archangelsky isolated andromedatoxin from the leaves of *Rhododendron chrysanthum* at the Laboratory of Experimental Pharmacology in Strassburg and showed that it was a profound blood pressure depressor, producing in dogs paralysis, vomiting, dypsnea, convulsions and, finally, death from respiratory failure. In 1949 a Turkish investigator working near Trebizond, where the troops of antiquity had come to grief, described a method for determining andromedatoxin in honey. In the 1950's a group at the National Institutes of Health in America partially analyzed the andromedatoxin molecule and showed that a dose as small as one part in ten million of the chemical lowered the blood pressure of dogs by 40 per cent.

Then a final, paradoxical chapter was added to conclude one of the strangest stories in the annals of medicine. A pure crystalline form of andromedatoxin was found to give good results in the treatment of high blood pressure in humans. At last, after two thousand, four hundred years of vicious affliction, the rhododendron had been converted from a bane to a benefit for mankind. A pharmaceutical manufacturer in Karlsruhe, Germany, is producing from rhododendron leaves a relief for one of the world's most pernicious illnesses. But the dose must be controlled. Larger amounts still bring death from respiratory paralysis.

O. H. Woodward

Monterey cypress (*Cupressus macrocarpa*) shaped by the winds of the Pacific on the headlands of Monterey Bay, California.

RARE CYPRESS CLINGS TO COAST HABITAT

Sherwin Carlquist

Condensed from *Natural History*, December 1965

FRINGING the wave-worn granite headlands that neighbor the town of Monterey, California, is one of the world's rarest trees—the Monterey cypress. In the two narrow strips of coastline where it tenuously clings, it matches the rocky grandeur of sea cliffs with fantastic growth forms promoted by the stress of an oceanside habitat.

A few hardy individuals of this species face the brisk winds and salty spray where promontory slopes yield to precipitous cliffs. Although cypresses generally are of a dense columnar or conical form, the unprotected Monterey cypresses are twisted and open; their sparse, contorted branches a result of the gusts that buffet the shores of the Monterey Peninsula. Complementing the tattered crowns are flanged and buttressed trunks and spreading roots, built up in response to wind pressures upon the trees.

The two native groves of Monterey cypress extend only about half a mile inland from the high-tide line. Within this small area, however, are less wind-whipped zones, and there the trees grow in dense groves, where layer on layer of their deep-green branches form a dark, thick canopy. Through these groves seep the fogs that so frequently blanket Monterey. The sprays of foliage, their surfaces constantly brushed by mist, act as centers of condensation and cause a sparse but steady rain within the groves.

The foggy climate may be one of the

reasons why Monterey cypresses are restricted to two small colonies in their native state. These two groves contain only about 10,000 trees, a diminutive number when compared with the total populations of most species of trees. Do these two cypress colonies represent a last stand of a once widespread species? If so, what factors have forced this tree into such a narrow edge of the Pacific coast? Or has the Monterey cypress always been limited to such a small area?

Although rainfall at Monterey is modest (between 15 and 20 inches per year), the ability of the cypresses to condense drops of water out of fog increases this total within a cypress grove. Soils become dry during the California summer, offering little ground water for trees. However, the moist air at Monterey decreases evaporation, so trees do not need as much ground water as they would in a less foggy climate.

With respect to soil, the Monterey cypress seems wedded to granite—a rock that produces a rather acid soil, varying from a pH of 5.5 near the surface to 4.5 near the parent rock. This acidity is maintained and magnified by the accumulation of dead foliage beneath the trees.

In addition to ecological requirements, there may be another important reason why the Monterey cypress occupies such a small niche. This reason is best explained in the botanical and horticultural history of the tree. It was supposedly first brought to Europe in 1838. We know definitely that specimens were gathered at Monterey in 1846 by the German botanist Karl T. Hartweg, who collected under the auspices of the London Horticultural Society. These specimens were used by Hartweg when he prepared the description of the tree he named *Cupressus macrocarpa,* and seeds from his collection were grown into trees in England. Soon, this tree gained favor in various parts of the world as a garden tree or as a windbreak.

Soon, however, signs of trouble became apparent. In 1928 a disease, the cypress canker, was reported from Monterey cypresses in middle western California. Cypress canker (caused by the fungus *Coryneum cardinale*), which has proved to be virtually impossible to control once it has attacked a tree, is a disease native to North America. Spores of the fungus enter the tree through injuries, breaks, or thin spots in the bark. The Monterey cypress has proved to be exceptionally susceptible to the ravages of *Coryneum* at localities other than Monterey itself. This leads one to ask: why not at Monterey?

Some plant disease experts, viewing the ocean-oriented distribution of cypresses native to Monterey, hypothesized that the salt spray inhibited growth of the fungus. Experiments showed that in distilled water 72 to 84 per cent of the fungus spores germinated, whereas in tests using glass slides covered with a film of sea water, 4 per cent or less of the spores grew. This evidence suggests that a continual light mist of salty spray from the ocean may sharply reduce the danger of infection.

We can therefore hypothesize that the Monterey cypress grows natively only in its two small stands near Monterey because it is a species precisely adapted to Monterey climate and soils. As a result, it is healthiest there.

* * *

MOUNT VERNON

THE Mount Vernon Ladies' Association has recently isued a handsome 100-page book, illustrated in color, describing the 18th-century home of George Washington and its grounds and gardens as they appear today. This paper-bound volume is available from the Association's headquarters, Mount Vernon, Virginia.

Acquisition of a broad stretch of wooded land across the Potomac River for a Federal Park is currently the Associations' leading interest. Unless the Department of the Interior acts promptly, *The Washington Post* has pointed out, land which has been donated with a time limit for the park will be withdrawn.

HAND-ME-DOWN GARDEN IDEAS

Do they still have value?

J. Harold Clarke

Condensed from *Horticulture*, August 1965

HOLDING to one's beliefs is the mark of a strong character. However, as science gives us more information and more reasons for the things that happen in the garden, the wise man is the one who is willing to change his beliefs as the facts are made clear.

Much garden lore has stood the test of scientific study. Other ideas, however, have been discredited by the searching light of modern experimentation.

In daring to suggest that certain ideas may be fancy instead of fact, I realize that some things may not be 100 per cent proved, but these comments are based on more than four decades of horticultural experience as well as contact with the literature of horticultural research.

I do not believe:

. . . that earthworms are especially helpful in improving a garden soil. It is true that a soil which is rich, moist and full of organic matter usually has a high population of earthworms. But, they are a result, not the cause of the good soil. Some have concluded that adding earthworms to infertile soil greatly improves it but research has not so indicated.

. . . that sprinkling frozen plants tends to prevent freezing injury. Such use of water (deep soil temperature and, therefore, soil water temperature is near 50 degrees) causes almost instantaneous thawing instead of a slow thawing and, therefore, may increase the damage.

. . . that sprinkling plants in full sun hurts them, although, I admit, a brief sprinkling in the middle of a hot day does not do much good. Sustained sprinkling on an extra hot day, on the other hand, can prevent heat burn.

. . . that mole traps need be handled with gloves, because the animals avoid traps that bear a human scent. We keep moles under control by trapping and use bare hands to set traps and to explore the runways every time.

. . . that all nitrogen should be withheld from plants except during early spring. Plants in poor soil, showing nitrogen deficiency, should have enough to bring them to a good green color any time during the growing season. Latest research seems to indicate that well nourished plants are more resistant to winter injury than those starved for nitrogen.

. . . that a mulch of oak leaves necessarily tends to acidify the soil. Experiments in Ireland indicate that leaves from oaks grown on alkaline soil had an alkaline reaction. Hence, oak leaves from nearby are unlikely to change the pH to any great extent. Still, an oak leaf mulch is good for rhododendrons for several other reasons.

. . . that the dangers from pesticides outlined in "Silent Spring" are nearly as real or as imminent as the author would have us believe. I do believe that governmental agencies have protected, and will continue to protect, the public health by proper regulations, which I believe are already needlessly over-protective. In fact, it is harder to get a pesticide accepted for sale than a medicine for human use.

. . . that organic matter in the soil builds any healthier plants than can be produced in a soil which is largely mineral in nature, and which has the necessary nutrients applied in chemical form. With proper care it is possible to produce healthier, more wholesome plants by liquid culture, with no organic matter whatsoever, than by the more conventional methods we normally use.

. . . that a mulch of organic matter necessarily prevents all pests or diseases or even gives significant control. But, use a mulch, if you can get it, for the moisture-conserving properties it has and for which mulches have been used successfully for generations.

POTABLE WATER FROM SEWAGE

In Amarillo, Texas, also Las Vegas, Nevada, and Santee, California (near San Diego), used water is being satisfactorily purified and re-used. It is creating lakes for recreation and furnishing farms and factories with their needed supplies. New York's Nassau County on Long Island hopes in time to have its diminishing underground sources of water replenished with purified waste water.

In a new experimental plant in Lebanon, Ohio, described below, water of drinkable quality is now being produced. Home gardeners will be among the millions of persons across the country who will benefit when scientifically treated sewage makes abundant moisture available everywhere for growing plants.

Richard D. James

Condensed from *The Wall Street Journal,* December 9, 1965

LEBANON, Ohio—A public health reseacher offers a visitor two apparently identical jugs of water from this rural town and challenges him to detect any difference. Outside of a faint yellowish tinge in one, they are indistinguishable, even in taste.

The slightly colored sample turns out to be ordinary tap water. The other is sewage transformed into pure drinking water at a pilot plant started here last summer as part of a Federal research project. Each day, taking a portion of the one million gallons of waste from Lebanon's 7,000 residents, it produces 75,000 gallons of potable water. The $150,000 installation, one of the first, is aimed at giving researchers a better idea of the costs and technical problems involved in the process.

Though still highly experimental, such work before long may open the tap on a major source of usable water: The 260 billion gallons of sewage and waste flowing each day from U.S. cities, industries and agriculture. Researchers are stepping up efforts to develop cheaper and better techniques for making this waste usable, and more communities are trying schemes for water reuse, using the secondhand product for a variety of purposes from swimming to irrigation.

Purer Than Sea Water

Water experts not only are convinced they can use sewage to help meet the country's rising demand for quality water, but they also believe it may cost less than desalting water from the sea, which has attracted considerable attention.

Polluted water that has gone through ordinary sewage treatment plants, they explain, is 35 times purer than sea water with its heavy salt concentrations; consequently purification is cheaper. In addition, sea water is economically available only along the coasts, whereas every community has sewage.

There's hardly a lack of raw waste material for the process. Of the 150 gallons of water used daily by the average city dweller, 120 gallons return contaminated to the sewers, a flood of more than 15 billion gallons a day for the U.S. as a whole. If cleaned up, it would provide enough water for the daily needs of 100 million people. In addition, the flow of waste from industry and agriculture swells the total to approximately 260 billion gallons a day—equal to 70% of the nation's water needs.

To some, the idea of using water extracted from sewage is repugnant, but

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Brooklyn Botanic Garden tests show

PLANTS INJURED BY CITY'S GASES

Craig R. Hibben

PLANTS can be noticeably injured by the atmospheric gases of a city. This has been long suspected but, except on the West Coast of the United States where smog is troublesome, few experiments have shown the extent or nature of the injury.

Last year the Brooklyn Botanic Garden set up two experimental chambers in one of its greenhouses. Identical plants of species known to be susceptible to certain gases were placed in each. Controlled amounts of outside air were drawn through each chamber—always the same for both. But through one inlet the air was partially filtered. Here are some of the results in the chamber receiving unfiltered air:

Tobacco, known to be sensitive to ozone, developed white flecks on the upper surface of the leaf. (Ozone is a dense form of oxygen which forms when hydrocarbons and certain nitrogen gases, primarily from automobile exhausts, react with sunlight.)

Petunias, similarly sensitive to such oxidants as ozone, and also to some elements of smog, such as is encountered on the West Coast, showed injuries characteristic of both.

Spinach, which is susceptible to smog injury, occasionally showed the same silvery glazing on the under surface of the leaves as has been noticed in New Jersey and West Coast vegetable fields.

Alfalfa, which is very sensitive to sulfur dioxide, such as comes from chimneys wherever coal is burned, did not become injured and remained healthy in both chambers.

Gladiolus, known to be sensitive to hydrogen fluoride, derived from certain factory exhausts, also remained healthy in both chambers.

In addition, in both chambers, tomatoes, known to be sensitive to ethylene gas (which comes from automobiles and industrial exhausts), showed a downward curving (epinasty) of the petiole, or leaf-stalk. Tomatoes in similar chambers at the Kitchawan Research Laboratory in Ossining, New York, did not show this epinasty.

With the exception of tomatoes, plants in the chamber supplied with filtered air gave only slight or no evidence of damage. Some tobacco and petunia plants kept there for several weeks grew longer shoots than companion plants maintained in the unfiltered

Similar chambers, one receiving filtered air, set up at the Brooklyn Botanic Garden, gave evidence of plant injury from city air.

chamber. At least one petunia variety on the grounds of the Brooklyn Botanic Garden showed the same type of oxidant injury as was revealed in the unfiltered chamber. The presence of ozone as one of the oxidants reaching the unprotected plants was confirmed by a characteristic cracking of ozone-sensitive rubber strips placed in the chambers.

These experiments demonstrate that by manipulating specific plants as biological monitoring tools for the detection of air pollutants, we can determine that certain gases, primarily from industrial and automobile exhausts, are accumulating in our urban atmosphere to high enough levels to be injurious not only to human beings, but also to plant life.

CALIFORNIA STUDIES

TO determine the nature, specific cause, and possible control of air pollutants that damage plants in the smog-laden atmosphere of parts of the West Coast, investigations are being made by the Los Angeles State and County Arboretum at Arcadia. The work is under the direction of Wilfred M. Noble, who is also studying effects of air pollutants on plants for the U.S. Department of Health, Education and Welfare.

A first report appears in *Lasca Leaves*, the Arboretum's quarterly publication, Winter 1965 ($1). In conclusion the author cites three continuing needs: (1) to develop resistant strains of plants; (2) to develop methods for protecting plants by means of sprays, dusts or nutrition; (3) to continue investigating atmospheric pollutants, for as one is eliminated, another may appear. (Exhaust controls, now required on all California cars, are helping to eliminate one source of injurious smog.)

* * *

(*Continued from page* 54)

experts contend that sewage in the first place is only slightly used water that has been extravagantly discarded. A gallon of raw sewage is said to carry only about 1-20th of an ounce of contaminants—considerably less than a teaspoonful.

In Lebanon, faintly muddy-colored effluent from a sewage treatment plant is pumped first through tanks of white, powdery diatomaceous earth (remains of microscopic marine organisms) to reremove suspended solids.

Then it trickles through cylindrical tanks of activated carbon—highly porous charcoal—that catches most of the remaining organic contaminants such as oils and insecticides. What remains is essentially tap water except for the big increase in dissolved solids, mainly salts. Much of these are pulled off by electrodialysis, in which the impurities are charged electrically and pulled through membranes carrying an opposite electrical charge.

Since the operation is entirely experimental, none of the pure water is being drunk on a regular basis. After testing, it is used to help dilute the pollution of Turtle Creek, which flows into the Ohio River. But plans are under way to build a bigger installation next year in some water-short community yet to be chosen where the reclaimed water will be used to supplement natural supplies.

(*Continued from page* 27)

duced in 1960, produce twice as many flowers as their predecessors, on much sturdier stems and heavier foliage—and blossom almost continuously throughout the growing season, in a huge mass of color. Sizes, too, have been redesigned. Cosmos, formerly five to seven feet tall, now comes in three-foot varieties also. Dwarf dahlias were developed during World War II, and since then we've had dwarf zinnias, dwarf snapdragons, dwarf delphiniums.

Meanwhile, for sentimentalists who dream wistfully of the gardens of yesteryear, the big mail-order catalogues still faithfully list many of the old-fashioned seeds.

FIVE-YEAR FERTILIZER—*in punctured plastic bags*

A NEWLY patented method of fertilizing plants assures that they will receive the correct amounts of nutrients at all times for three to five years with a single application. No additional feeding is required during the entire period.

The secret lies in controlled release through a plastic film. A small amount of highly concentrated fertilizer is packed in a plastic bag about the size of a powder puff. The plastic is punctured with microscopic holes that allow water to seep in and dissolve the contents slowly. By controlling make-up of fertilizer and size of holes, research workers have devised a package that will feed plants adequately for several years.

The dissolved fertilizer can be forced out only when enough water accumulates inside to create internal pressure. It is then released at a rate equal to absorption by the plant. None is released in freezing weather when it is not needed.

At the time of planting a single packet is placed in the soil beneath a shrub. When its contents are exhausted, a second packet can be inserted in a hole made with a trowel or spade. In the same way, it can be applied to established plants, and it appears to be useful for any kind, from house plants to trees. The fertilizer cannot injure tender roots.

The technique was originated and has been perfected by soil scientists at the University of Wisconsin. The patent for it is administered by the Wisconsin Alumni Research Foundation. Manufactured by S & D Products, Inc., Prairie du Chien, Wisconsin, the micropore release packets are expected to be on the market in the spring of 1966 under the name of Eeesy Grow. About 39 cents' worth is said to be enough to feed a rosebush or other shrub for its first five years.

(*Continued from page* 31)

copper, manganese, boron, iodine, aluminum, mercury, cobalt, zinc and silver. Some of these are very scarce where trees grow, but in the copious stream inside a tree trunk, as in the currents of the primeval sea, even the rarest elements turn up. The moment underground water is sucked through the walls of root hairs and starts to flow through the labyrinthine channels of the roots toward the trunk of the tree, it becomes sap with a fine and rare quality. It is purer than water in a mountain spring, for it contains no bacteria and no organic matter. These have been carefully filtered out by the cell walls.

Here is, indeed, an arresting paradox. Trees flourish the more in fertile humus teeming with bacteria and packed with organic matter from decayed cells. Yet all bacteria and organic matter are excluded from the water that enters the roots and mounts the trunk. . . .

Fertile humus is a stewpot holding concentrations of the elements—particularly atoms of sulfur, phosphorus and minerals—that had been assembled in the cells of all sorts of living things. In the humus they are being released by decay, and dissolved in the ground water. Solutions of their freed atoms permeate the soil where they are picked up by the tree roots. They will flow to the top of the canopy where they bring their offerings of elements to living cells in leaves, buds and flowers. . . .

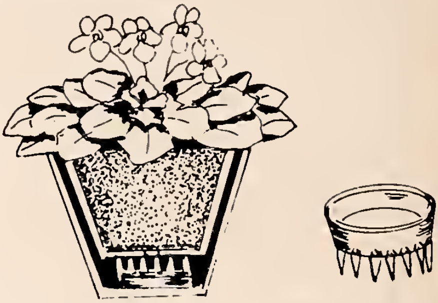
In ways like these, free and fluid elements dissolved in underground water contribute to the creation and prosperity of beautiful trees. Many of these elements are abundant and found almost everywhere, others are very scarce. Yet the great excess of water lifted, far more than is needed for a tree's own cells, is insurance that even the rarest elements will turn up sooner or later. The mighty living system which drives roots into hard ground, splits rocks, thrusts wedges into cracks of cliffs, lifts canopies of leaves high in the air, and causes a river of sap to flow between the deepest root and highest twig—operates on such a scale that it can search out and find all the elements it needs and deliver them to the right place at the right time.

GARDENER'S MISCELLANY

Brief notes from 1965 publications

Plant Labels of Many Kinds. Wherever plants are grown for public display, clear and durable labels are needed. Often they are equally desirable in home plantings. To help superintendents and gardeners to choose the most useful type of label, the American Association of Botanical Gardens and Arboretums has devoted the 61 pages of its April-July *Quarterly Newsletter* entirely to labels. Available for $1.50 from Dr. Fred Widmoyer, Department of Horticulture, New Mexico State University, University Park, N. M.

"Non-Slip" Cedar Rounds. When cedar rounds are to be used for garden or woodland paths or patios, they can be made safer for footing if given a special coating, according to Betty (Mrs. Pendleton) Miller of Seattle, Washington, in the *Bulletin* of the American Rock Garden Society for July. She makes a thick mix of very dry sand with Steelcote Lay-tite Rubber Base Coating LT 40 clear (which can be ordered from a paint or hardware store for about $12 a gallon) and applies it to the wood.



Plastic rug-protector aids drainage of potted plants when placed under the pot, prongs upward. When excess water is applied there is room for it to drain into the outer container.—*Gesneriad-Saintpaulia News,* November-December.

Delayed Bloom, More Fruit. When the flowering of Bartlett pears is delayed by a spray of the growth-retarding chemical "B-NINE", the next fruit crop is larger. The later flowering prevents loss of blooms by late spring frosts. The experiments are reported in *California Agriculture* for November 1965.

Successful rooftop test garden. A properly combined soilless rooting medium has many advantages over soil for roof gardening. This has been proved after two years of experimentation conducted by Richard Farnham, Executive Secretary of the Horticultural Society of New York. In addition to its much lighter weight (an especially important factor on a roof), it offers lower cost, less watering and easier maintenance. Furthermore, the plants it supports are vigorous and successful in withstanding drought. A leaflet describing the experiment and giving directions for the successful rooting medium is available without charge from the Horticultural Society, 160 Central Park South, New York, N. Y. 10019. Send stamped self-addresed envelope.

WORTH READING—*Selections from 1965 books*

Gardening in General

The Rockwells' Complete Guide to Successful Gardening. F. F. Rockwell and Esther C. Grayson. What—When—How—North—South—East—West. 518 pages, many photographs; line drawings by Virginia Howie. Doubleday, Garden City, N. Y. $6.50.

The first two parts of the book concern the planning, planting and maintaining of home grounds and special gardens and plant materials. Part III is a country-wide monthly calendar. The appendix contains lists of useful plants for different regions, charts for control of garden troubles, and lists of botanic gardens and arboretums, also of parks and display gardens, special plant societies, and books for further reference.

Adventure in My Garden. Helen M. Fox. 167 pages, 127 halftones, 12 pages in color. Crown Publishers, New York. $4.95.

Charmingly written autobiographical account of a long lifetime of gardening, replete with good advice for other gardeners. (See page 16 for excerpt.)

A Garden Full of Flowers. Nancy Ruzicka Smith. 241 pages, many photographs. Charles Scribner's Sons, New York. $5.95.

Intimate in style, yet packed with useful information; geared to the new gardener who is no more aware of problems than of possibilities in developing home grounds. Lists, charts and plant descriptions accompany the reading text.

Around the Garden Week by Week. Joan Lee Faust. 120 pages, drawings in color by Betty Fraser. Appleton-Century, New York. $3.95.

Gleanings from the garden pages of *The New York Times*, with a blank page for each week's hand-written notes.

Special Plants

The Art of the Chrysanthemum. Japanese Techniques for Creating Bonsai, Cascades, Giants, and Other Potted Styles. Tameji Nakajima, with the collaboration of H. Carl Young. Foreword by Ernest Lyman Scott. 259 pages, 44 color illustrations, 114 photographs, 37 drawings. Harper & Row, New York. $9.50.

Precise details of cultural practices, aimed at plant perfection rather than showiness, precede the sections on the creation of chrysanthemum bonsai and larger styles of potted plants. The author is founder of Japan's first chrysanthemum bonsai club; his collaborator is a former U. S. military man who has made Japan his home and chrysanthemums his hobby since 1950.

The Azalea Book. Frederick P. Lee. 435 pages, 5 color plates drawings and photographs. Endpaper maps of hardiness zones and blooming periods. Second edition. An American Horticultural Society book. D. Van Nostrand Co., Princeton, N. J. $12.

New material in this edition, after only seven years, includes additional facts on hardiness, on propagation from cuttings, pests and diseases, mycorrhizae, and naming and registration of new azaleas. New varieties have been added to the descriptive lists. A guide to commonly cultivated azaleas has been provided, also lists by flower color and type of foliage (evergreen or deciduous) for each of five geographical areas of the United Staes. The roster of azalea nurserymen has been revised and a new appendix added on azaleas introduced through the U.S.D.A. Plant Introduction Section.

The Joy of Geraniums. Helen Van Pelt Wilson. 364 pages, 74 photographs and drawings, 11 color plates by Elaine Ruth Harman. M. Barrows & Co., New York. $6.95.

The fourth edition of the original *Geraniums — Pelargoniums for Windows and Gardens* of 1946, completely rewritten and greatly enlarged. Identification of plants in six separate groups, culture, uses, propagation, breeding — every topic wanted by the grower is included in the 21 chapters. Near the end, a useful "finder's list" of species and selected varieties covers nearly 40 pages.

Anyone Can Grow Roses. Cynthia Westcott. 220 pages, 40 drawings. D. Van Nostrand Co., Princeton, N. J. Fourth edition $5.95.

The author's enthusiasm matches her sound approach and shows that she believes in her title. Clear-cut cultural directions are followed by descriptive lists of roses recommended for different parts of the country, also the planning of a rose garden, exhibiting, propagation, pest control, and a long list of books for reference.

The Guide to Garden Shrubs and Trees. Norman Taylor. 450 pages, illustrated in color and black and white by Eduardo Salgado. Houghton Mifflin Company, Boston, Mass. $6.95.

Comprehensive descriptions and illustrations of 500 woody plants, arranged by botanical characteristics. Size, garden use, and culture are among the helpful details included.

Trees and Shrubs for the Northern Plains. Donald G. Hoag. 376 pages, photographs in color and black and white, drawings of leaf, twig and bud forms. North Dakota Institute for Regional Studies. Fargo, N. D. $12.50.

The Northern Plains of the United States have never had a full share of ornamental woody plants, either by nature's endowment or man's activity. Trees are not easy to grow in a land with scarcity of rainfall. This book has special value, therefore, in describing trees and shrubs particularly suited to the area and in telling how to plant and maintain them.

A Garden of Trees and Shrubs. Practical Hints for Planning and Planting an Arboretum. Fred Lape, 129 pages, photographs and drawings. Cornell University Press, Ithaca, N. Y. $7.50.

What not to do as well as what to do when planting a large area to trees and shrubs, told by the director of the George Landis Arboretum, Esperance, New York.

The Concise Encyclopedia of Favorite Wild Flowers. A Hundred Native Plants to Appreciate in the Wild and to Grow in the Home Garden. Marjorie J. Dietz. 308 pages, profusely illustrated with wash drawings by Katherine Burton and with photographs; colored frontispiece. Doubleday & Co., Garden City, N. Y. $4.95.

For each plant the botanical name is given, with pronunciation, the type of plant (perennial or otherwise), uses, habit of growth, flowers, foliage, assets, faults and culture.

Collector's Alpines. Royston E. Heath. 527 pages, 86 photographs, 37 line drawings. Collingridge, London. 4/4/—.

A book for the connoisseur. Included are descriptions, cultural directions and fine portraits of many choice alpine plants.

Modern Roses 6. Compiled by the McFarland Company in association with the American Rose Society. 497 pages, 16 color plates, 16 halftones. McFarland, Harrisburg, Pa. $19.50.

Condensed description of all roses known to be in cultivation, plus those of historical importance. Names, synonyms and parentage are given, also hybridizers and introducers. Chromosome number and Plant Patent numbers are included among other details.

The Rose Question-and-Answer Book. John Milton. 192 pages, drawings. Hearthside Press, New York. $3.95.

Passifloras for Your Garden. Florence Knock. 100 pages, illustrated, partly in color. Diversity Books, Kansas City, Mo. $4.95.

Flowering Bulbs for Winter Windows. Marian C. Walker. 107 pages, 23 photos. D. Van Nostrand Co., Princeton, N. J. $4.95.

Bromeliads, the Colorful House Plants. Jack Kramer. 113 pages, full-page drawings of 30 species, color photos of 18 species and groups by Andrew R. Addkison. D. Van Nostrand Co., Princeton, N. J. $5.95.

All About Geraniums. Peggie Schulz, 175 pages, 115 illustrations, some in color (drawings by Isabel Jones). Doubleday & Co., Garden City, N. Y. $4.95.

Gloxinias and How to Grow Them. Peggie Schulz. 128 pages, drawings and photographs, four in color. Revised edition. M. Barrows & Co., New York. $4.50.

A Witch's Guide to Gardening. Dorothy Jacobs. 118 pages, illustrations from old herbals. Taplinger Publishing Co., New York. $3.00.

Climbing Roses, Old and New. Graham Stuart Thomas. 203 pages, photographs, drawings, diagrams, 8 color plates from watercolors. Phoenix House, London. $6.63.

Pleasures of Herbs. Audrey Wynne Hatfield. 186 pages, drawings by author. St. Martin's Press, New York. $3.95.

Aspects of Landscaping

Ornamental Trees for Home Grounds. Harold O. Perkins. 110 pages, photographs and drawings. E. P. Dutton & Co., New York. $4.50.

A practical guide for the selection, placing, planting and care of trees to be used near houses. One unusual chapter deals with tree evaluation, giving examples from the 1965 formulas of the International Shade Trees Conference.

All About Rock Gardens and Plants. Walter A. Kolaga, 385 pages, 60 photographs, construction drawings by Eva Melady. Doubleday & Co., Garden City, N. Y. $4.95.

Probably the most comprehensive book on rock gardening that has yet appeared in the United States. The ten descriptive chapters are followed by extensive lists of plants for various seasons, locations, conditions and effects.

Dwarfed Fruit Trees. Harold B. Tukey. 562 pages (7 x 10), numerous drawings and photographs. Macmillan, New York. $15.00.

Limitations as well as expectations of dwarfed fruit trees, are first discussed. Tree structure and physiology are then made clear as an introduction to dwarfing methods. Dwarfing rootstock, propagation, orchard management and performance are described in detail. The book concludes with ideas for using dwarfed fruit trees as special interests — in pots, under glass, as bonsai and as ornamentals.

Gardening by the Sea. Daniel J. Foley. 20 chapters, 285 pages, profusely illustrated with photographs; 4 pages in color. Chilton Books, Philadelphia, Pa. $6.95.

Lawn Guide. Tom Stevenson. 76 pages, illustrated. Robert B. Luce, Inc., Washington, D. C. $1.95.

Flower Arrangement and Bonsai

Better Homes and Gardens Flower Arranging. 158 pages, (8 x 11), many photographs, mostly in color. Meredith Publishing Co., Des Moines, Iowa. $3.95.

A basic guide to oriental and occidental styles in traditional as well as modern designs.

The Japanese Way with Flowers. Rachel C. Carr. 128 pages, Harper & Row, New York. $4.95.

Brief, clear, elementary yet satisfying. Wash drawings by Alain R. Carr are a special attraction.

Flower Arrangement with Antiques. Beth Hemingway. 191 pages, many photographs, 4 color pages. Hearthside Press, New York. $5.45.

The New Book of Foliage Arrangements. Emma Hodkinson Cypher. 152 pages, numerous photographs. Hearthside Press, New York. $4.95.

Flower Arrangements by Tat. Tat Shinno. 100 pages, many illustrations, 4 pages in color. Paper bound. Lane Books, Menlo Park, California. $1.95.

Creative Decorations with Dried Flowers. Dorothea Schnibben Thompson. 125 pages, profusely illustrated, partly in color. Hearthside Press, New York. $6.95.

Abstract and Not-so-Abstract Flower Arranging. Mary G. Knight. 111 pages, illustrated in halftone and color. D. Van Nostrand Company, Princeton, N. J. $5.95.

Holiday Flower Arrangements, Revised. Emma Hodkinson Cyphers. 128 pages, profusely illustrated, 2 pages in color. Hearthside Press, New York. $4.95.

Practical Bonsai for Beginners. Kenji Murata. 120 pages, illustrated. Japan Publications Trading Company, Rutland, Vermont. $3.95.

Emphasis on Pictures

Joseph Wood Krutch Herbal. 255 pages (9 x 12), 106 full page plates from Pierandrea Mattioli: *Commentaries on the Six Books of Dioscorides* (16th century). G. P. Putnam's Sons, New York. $20.00.

The plates chosen are among the finest known in early European works on plants. Quotations from old herbals and pertinent comments by the author-compiler face each plate. Introductory pages deal with herbs in their relation to cookery, modern drugs, astrology, the doctrine of signatures, and botany and gardening.

Tree Flowers of Forest, Park, and Street. Walter E. Rogers. 499 pages, drawings and photographs of 121 kinds of trees. Dover Publications, New York. $3.00.

Flowers, fruits, twigs, foliage, and silhouettes of leafless trees are among the drawings from nature by Olga A. Smith that accompany these striking photographs of tree flowers. A brief text is provided for each species. This is a welcome reprint of a book whose first edition of 1500 copies, privately printed, was too soon exhausted.

Fruit Prints. Eva Mannering, editor. 22 full-page plates in color by Turpin, Porteau and Riefel, with brief introduction.
Camellias. Beryl Leslie Urquhart, editor. 20 reproductions from paintings by Paul Jones, with brief introduction. "Golden Ariel" books. D. Van Nostrand Co., Princeton, N. J. $3.95 each.

Roses. Anne Ophelia Dowden (artist) and Richard Thomson. 46 pages ($6\frac{1}{2}$ x 4), illustrated in color. Odyssey Press, New York. 95 cents.

The Art of the Garden. Miles Hadfield. 160 pages ($4\frac{3}{4}$ x 7). A Dutton Vista Picturebook. E. P. Dutton & Co., New York. $1.75.

Techniques and Structures

Fluorescent Light Gardening. Elaine C. Cherry. 256 pages, 36 illustrations. D. Van Nostrand Co., Princeton, N. J. $6.95.

Technical information as to the setting up of lights and also meeting the plants' cultural requirements is clearly given. The long descriptive list of plants suggested includes many novelties.

How to Build Garden Structures. Henry B. Aul. 384 pages, 80 designs, each illustrated with drawings. Hart Publishing Co., New York. Paper-bound reprint of earlier edition. $1.95.

The Complete Book of Gardening under Lights. Elvin McDonald. 215 pages, 13 color plates, drawings. Doubleday, Garden City, N. Y. $4.95.

Garden Pools, Fountains & Waterfalls. 80 pages, drawings and many photographs. Paper bound. Lane Publishing Co., Menlo Park, Calif. $1.95.

Biography

Charles Darwin. A Scientific Biography. Sir Gavin de Beer. 295 pages, photographs and drawings. Paper bound. The Natural History Library. Doubleday & Co., Garden City, N. Y. $1.45.

The Reverend John Clayton. A Parson with a Scientific Mind. Edmund Berkeley and Dorothy Smith Berkeley, editors. 170 pages (7 x 10). The University Press of Virginia. Charlottesville, Va. $6.50.

Mainly for Reference

Touring the Gardens of Europe. Dorothy Loa McFadden. 306 pages, maps, photographs, lists of gardens by countries. David McKay, New York. $5.95.

Garden Shrubs and their Histories. Alice M. Coats. 416 pages, 20 illustrations, some in color. E. P. Dutton & Co., New York. $8.95.

Museums U.S.A. A History and Guide. Herbert and Marjorie Katz. 395 pages, 40 photographs. Doubleday & Co., Garden City, N. Y. $6.50.

Plants and Civilization. Herbert G. Baker. 183 pages, photographs and drawings. Paper bound. "Fundamentals of Botany" series. Wadsworth Publishing Co., Belmont, Calif.

Plant Hybridization Before Mendel. H. F. Roberts. 374 qages, illustrated. Facsimile of 1929 edition. Hafner Publishing Co., New York. $6.75.

Introductory Soils. Kermit C. Berger. 371 pages, illustrated. Macmillan, New York. $6.95.

Flora of Japan (In English). Jisaburo Ohwi, edited by Frederick G. Meyer and Egbert H. Walker. 1,067 pages (7⅝ x 10⅝), 16 photographic plates, 17 pages of drawings. Smithsonian Institution, Washington, D. C.

Spores—Ferns. Microscopic Illustrations Analyzed. Clara S. Hires. 548 pages (8½ x 11), profusely illustrated with drawings and photomicrographs. Mistaire Laboratory, Millburn, New Jersey.

The Handbook for Flower Shows. Staging, Exhibiting, Judging. 213 pages, paper bound. National Council of State Garden Clubs, Inc., 4401 Magnolia Avenue, St. Louis, Missouri 63110. $3.75.

For Reading as Well as Reference

The Great American Forest. Rutherford Platt. (Joseph Wood Krutch, consulting editor), 271 pages, illustrated with 34 photographs by the author and drawings by Stanley Wyatt. Prentice-Hall, Englewood Cliffs, New Jersey. $6.95.

A volume in the publisher's series in nature and natural history which well fulfills the dual aim of useful reference and lively reading. (See page 30 for excerpt.)

Tall Trees and Far Horizons. Adventures and Discoveries of Early Botanists in America. Virginia S. Eifert. 301 pages, illustrated with photographs, maps and drawings by the author. Dodd, Mead & Co., New York. $5.

Some of the first observers of the natural scene in North America bore names that are little known today—among them John White, who landed on Roanoke Island in 1590; Father Claude Dablon, a Jesuit in Canada a century later; but Virginia Eifert makes them live along with the better known pioneers, explorers and naturalists such as David Douglas, Mark Catesby, John Muir and Lewis and Clark.

My Friend the Garden. Fernand Lequenne. Translated from the French by Suzanne Combes Taylor, 225 pages. Doubleday & Co., Garden City, N. Y. $4.95.

A personal, contemplative, sometimes anecdotal book by a French lawyer who loves all things concerned with growing plants.

(*Continued from page 7*)

foliage arrangement suggesting the shape of an umbrella. Some trees assume this form only at maturity.

Weeping trees have branches which hang freely from the trunk, the tips of the branches tipping toward the ground. Their rather unnatural-looking form limits their use to flat surfaces. Near a house they can offset the slope of a steeply pitched roof.

Texture

Since textural quality is a surface aspect, it is frequently ignored when trees are being selected for a landscape. Texture of foliage, also of flowers, fruits, branches and bark, should be considered in their relationship to architectural structures and outdoor space.

Dense- or coarse-textured trees are those with compact large and heavy foliage, heavy trunks and branches. They dwarf an area, especially one that is enclosed by walls or hedges or a group of buildings. This type of tree is useful where noise abatement is necessary.

Open- or medium-textured trees are less definite in form than those with coarse texture and are not as strict or severe in outline. Trees of this type relieve the heaviness of architectural structures and create an impression of greater space in enclosed areas.

Filamentous-textured trees are lighter and more airy than medium-textured trees. The branches, twigs, and leaves are small and slender, producing an extremely delicate effect. The feathery foliage is valuable in creating the illusion of space, especially when these trees are placed behind coarse-textured plants. Trees with refined foliage, not only small in size but elegant in shape, also appear to increase the size of an area, and they blend with smooth architectural surfaces.

Environment

The environment in which a tree thrives and reaches its greatest expression in form and vigor is an important consideration. A starved, disease-ridden tree, struggling for existence, does not possess the landscape merit of one in a healthy condition.

In the South and Southwest, trees which can endure high temperatures without evidence of distress must be chosen. In areas where drought prevails, trees resistant to long dry periods are needed.

In urban areas where smoke, dust, gases, and other atmospheric contaminants exist, species or varieties known to be resistant to the toxic and clogging effects of air pollution should be sought. And such trees will perform more satisfactorily if provided with cultural advantages, such as excellent drainage to prevent the soil from becoming impregnated with impurities.

Practical Considerations

Rate of growth. Where there are no trees at all, shade, background, and framing conditions may dictate rapidly-growing trees rather than ones of medium or slow growth.

Light conditions. Since some trees thrive in a sunny location while others do better in shady or semi-shady locations, the amount of light prevailing where a tree is to be planted has a definite bearing on the choice.

Exposure. The prevailing wind on the site to be landscaped should be carefully studied. Where the wind is strong, trees having brittle or soft wood or a shallow root system should be avoided.

Utilities. The location of underground drains and other utilities should be checked to determine whether the tree roots would interfere with them, if the trees have vigorous water-seeking roots.

Maintenance. Time and money will be expended in additional maintenance if the trees are susceptible to serious attacks by insects or disease, or if they shed leaves, portions of bark, fruit, or other litter which must be removed periodically.

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